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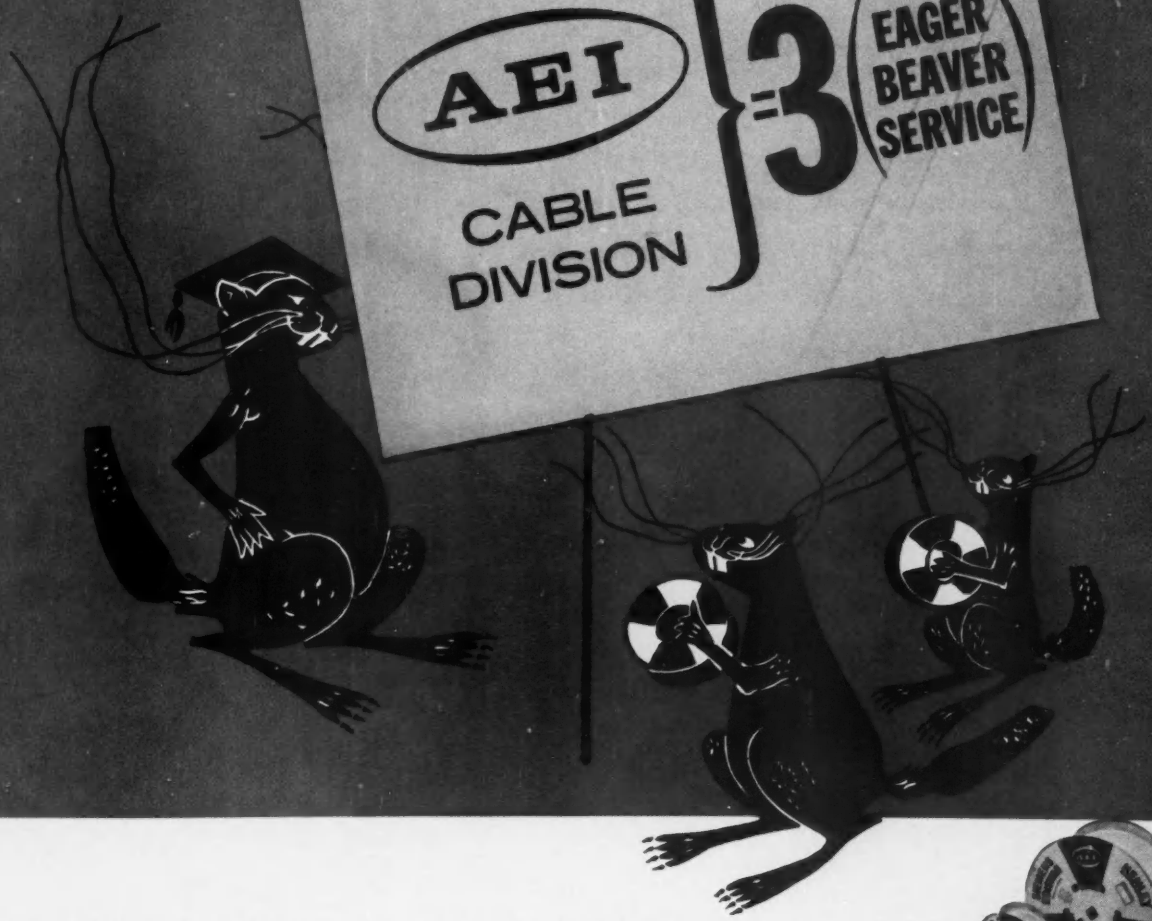

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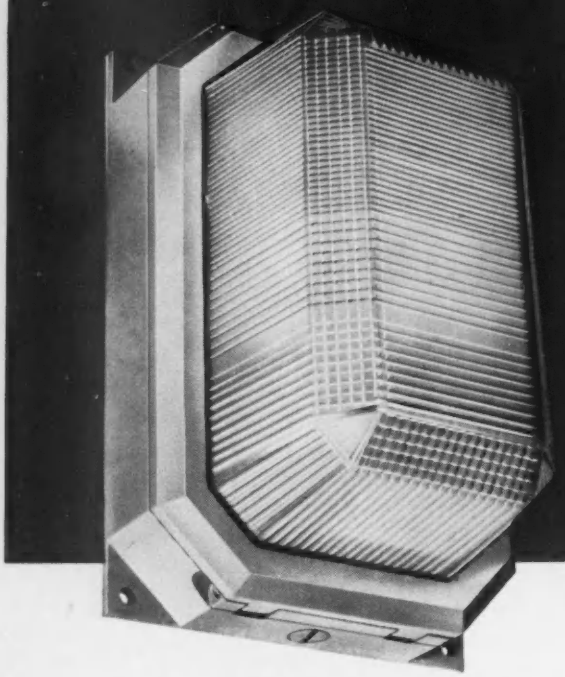

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8 50w MBF/U lamp provides 1,350 lumens throughout life of 5,000 hours with good colour correction.*

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Exterior measurements: $11\frac{5}{16}$ x $7\frac{5}{16}$ x $5\frac{1}{2}$ in., weight 8 lb.

Standard finish: Light Grey BS colour 631.

Note: For installations where PF correction is not required or where bulk PF correction is operating, the fluorescent "Widerlites" can be supplied without capacitors. All fittings are suitable for installation in ambient temperatures up to 35°C wall mounting and 25°C ceiling mounting.

(Holophane do not supply the lamps)

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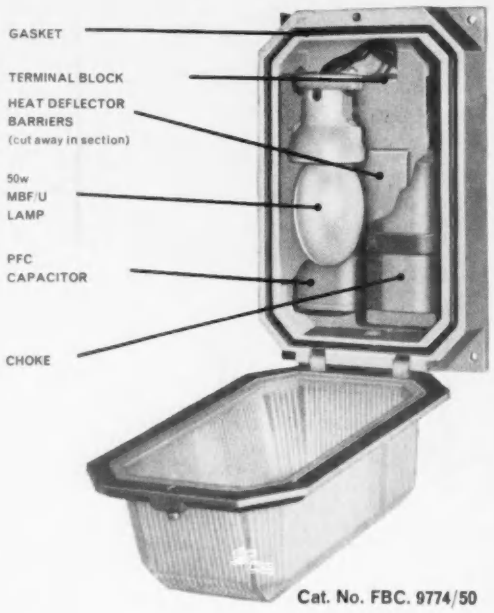

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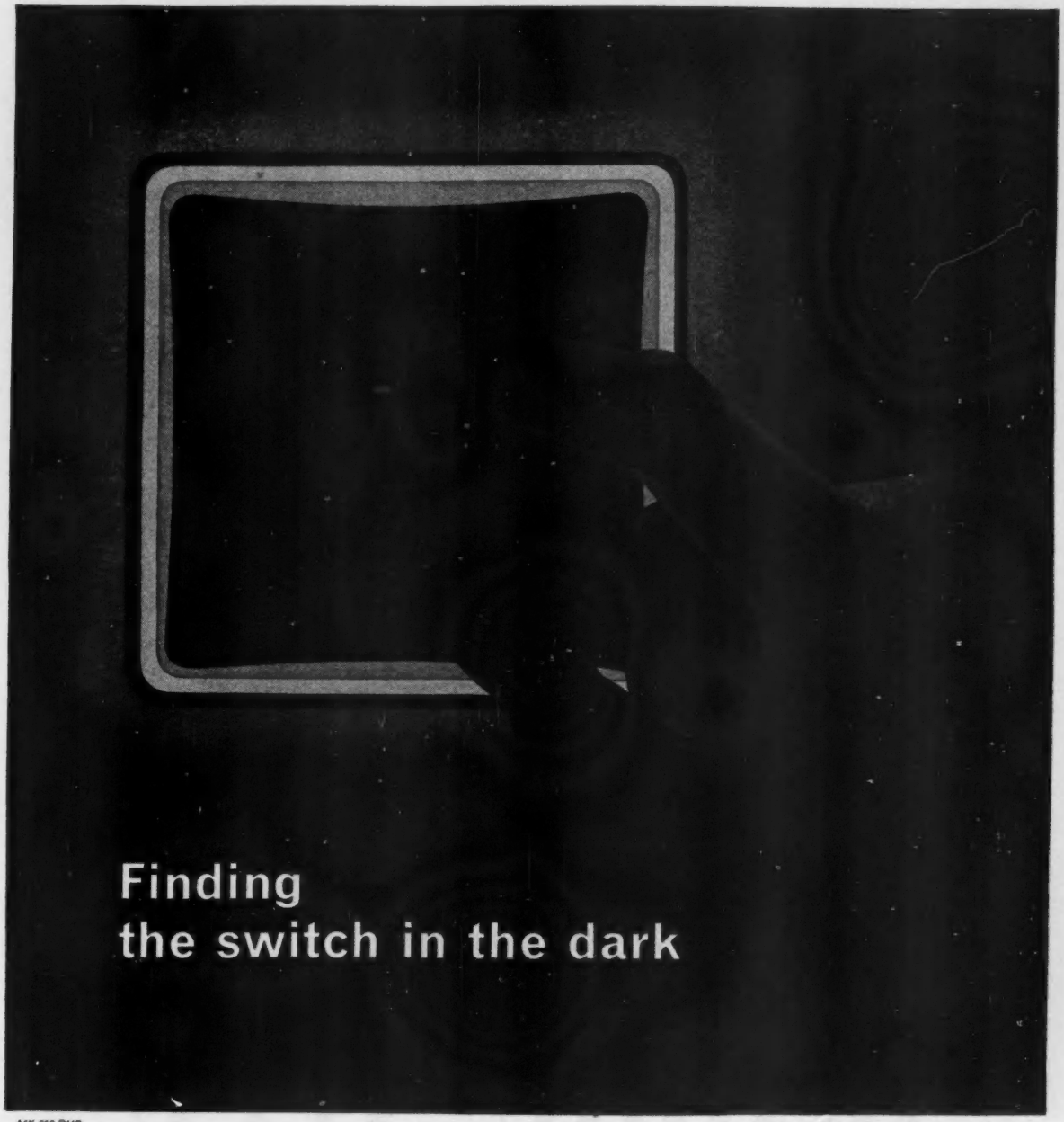

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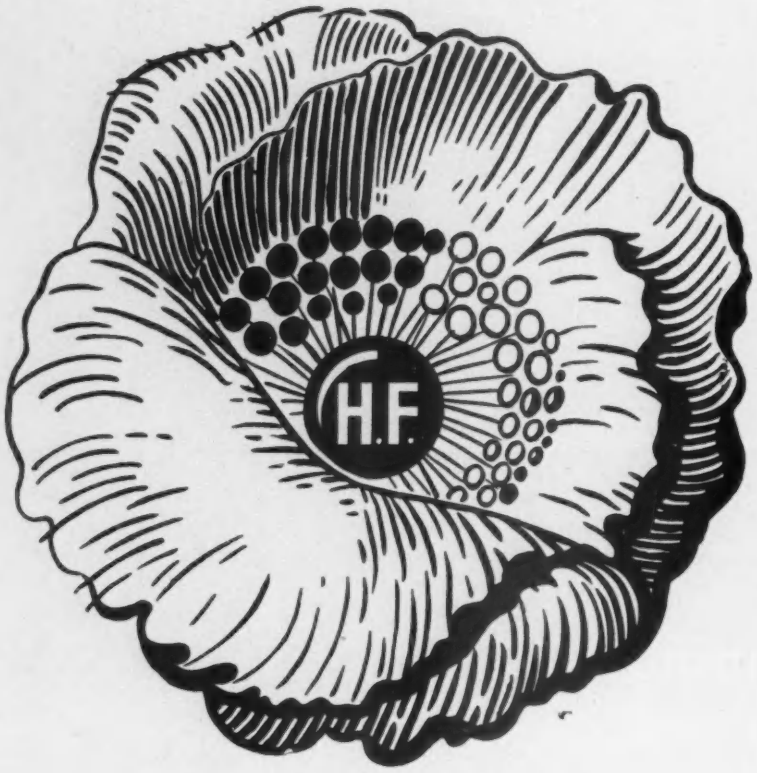

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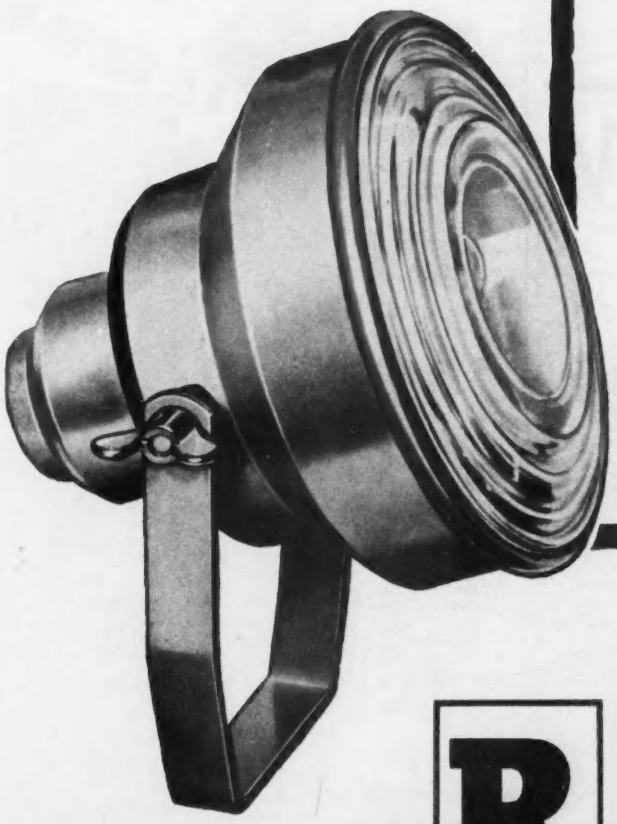

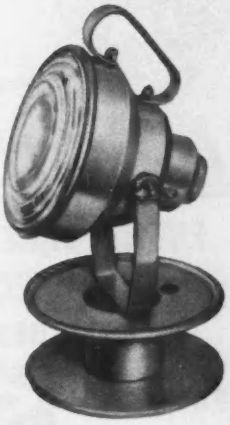

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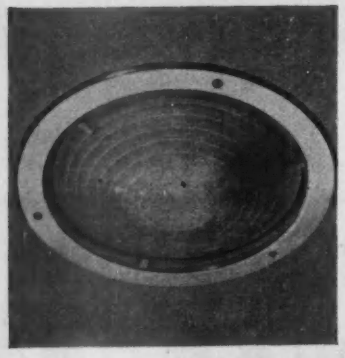

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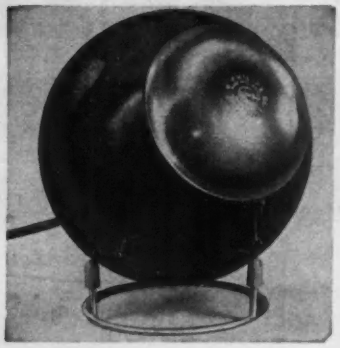

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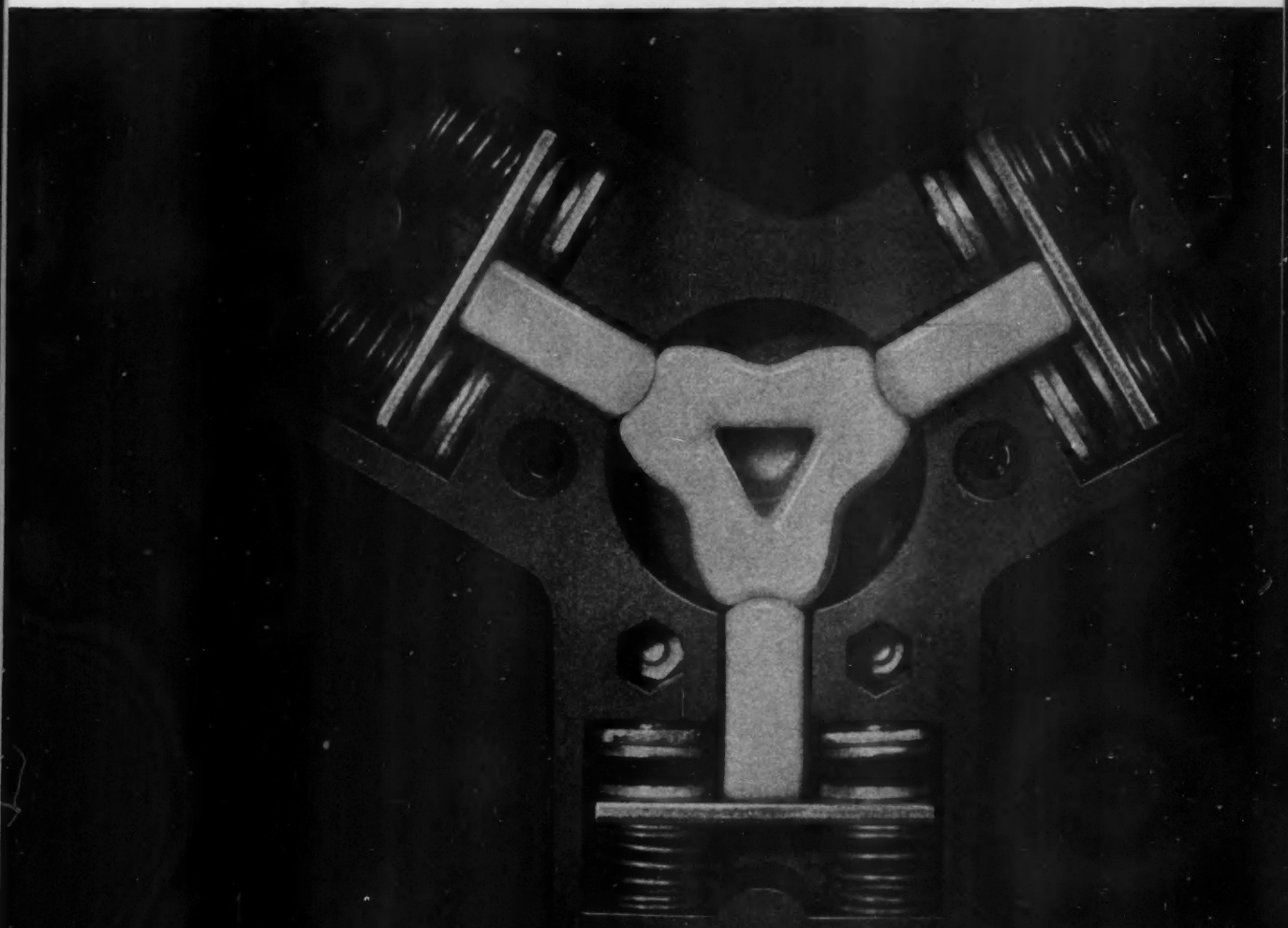

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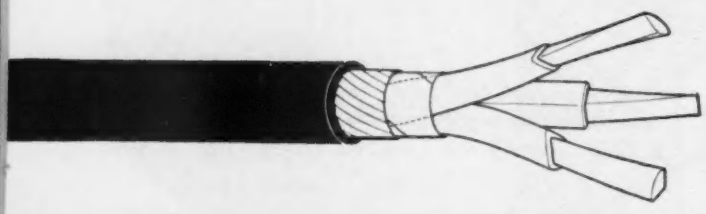

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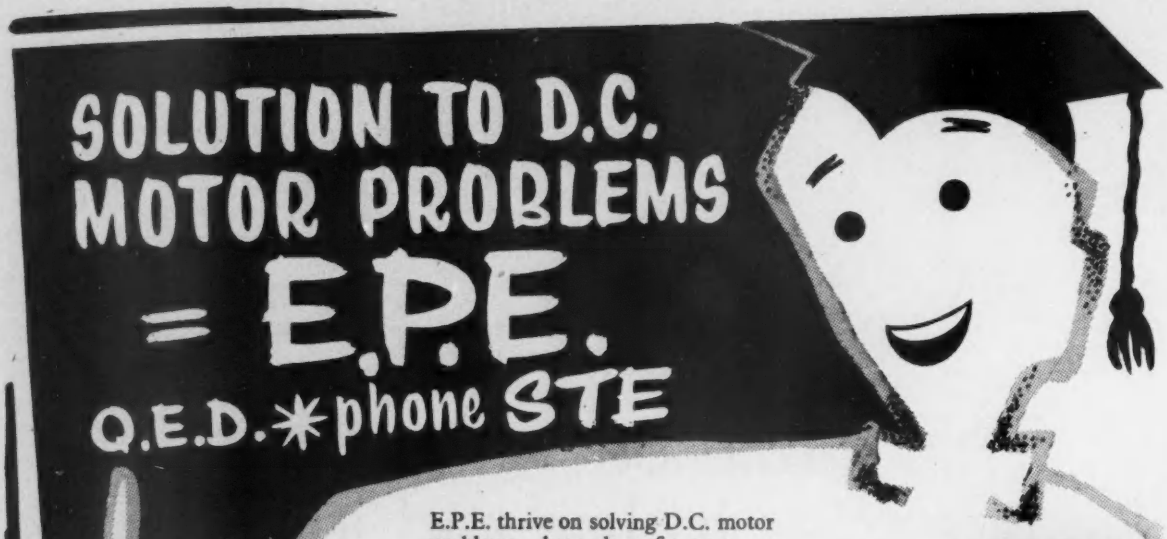

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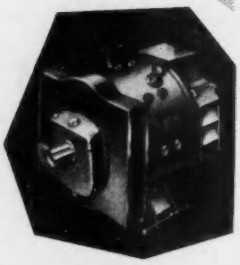

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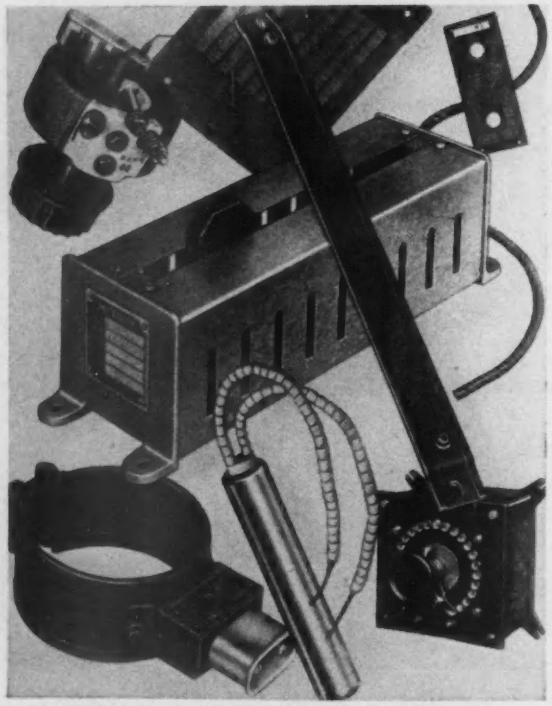

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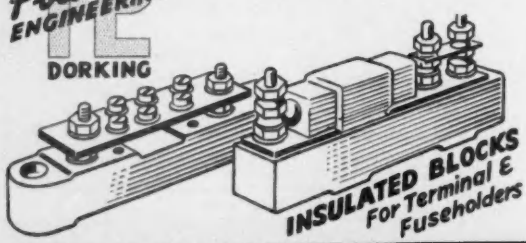

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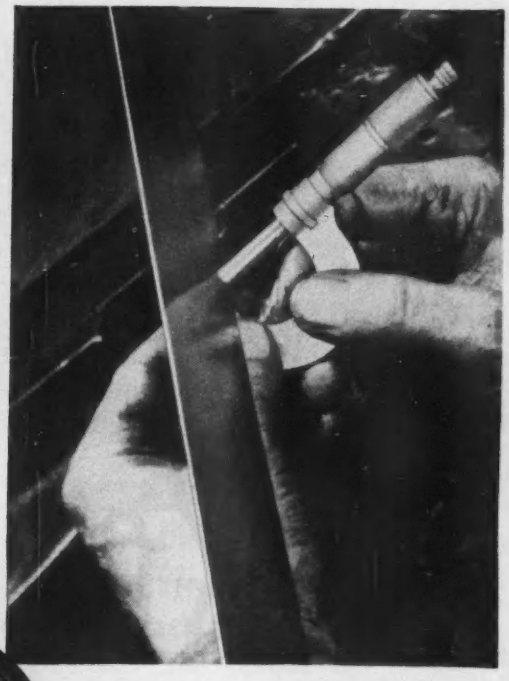

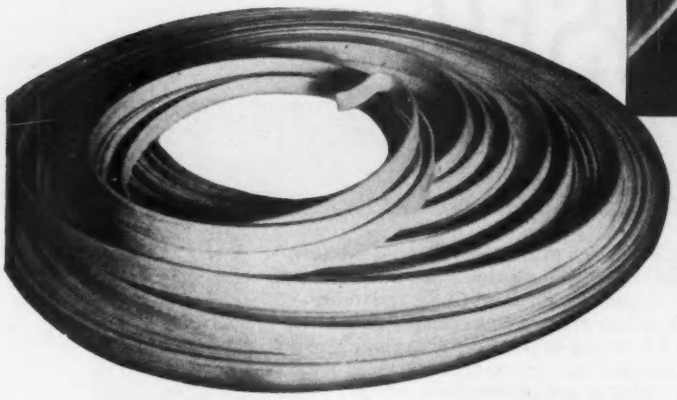

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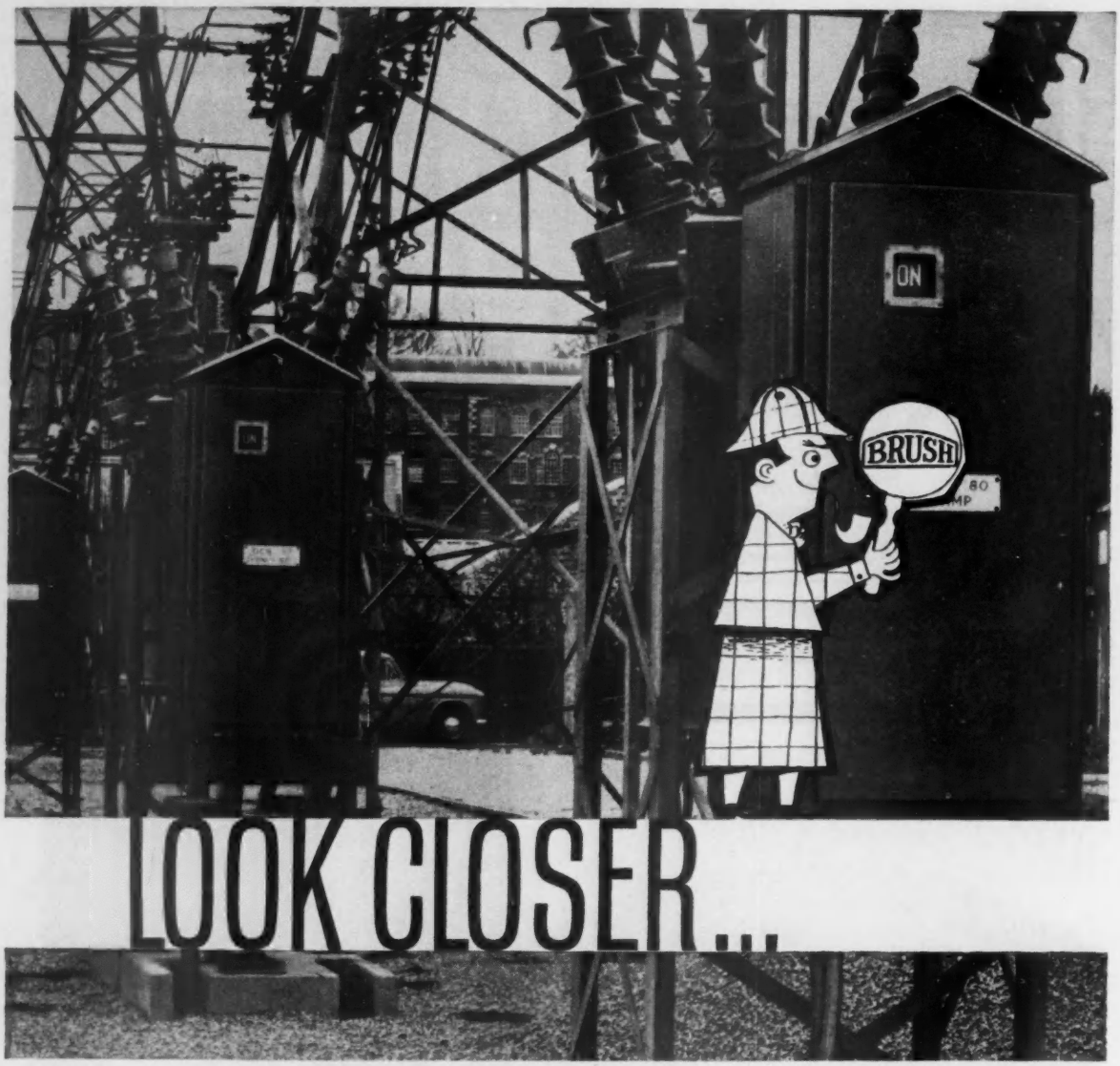

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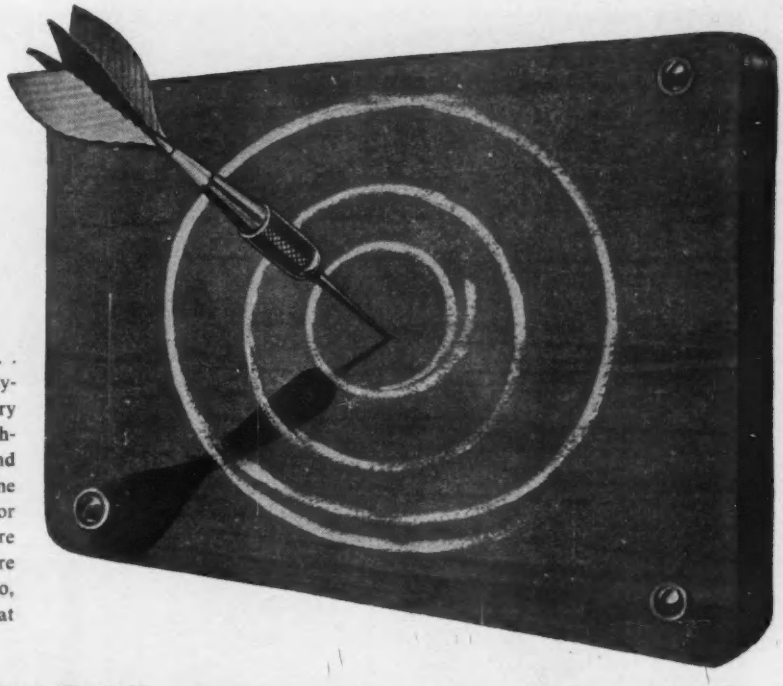

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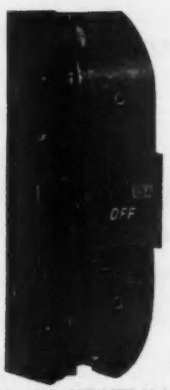

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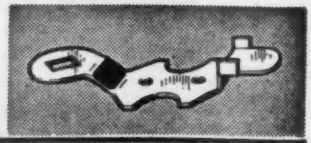

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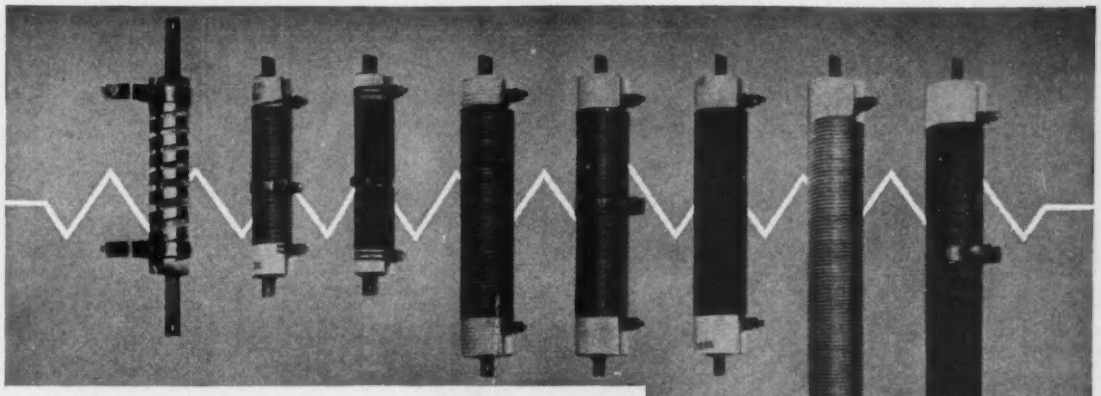

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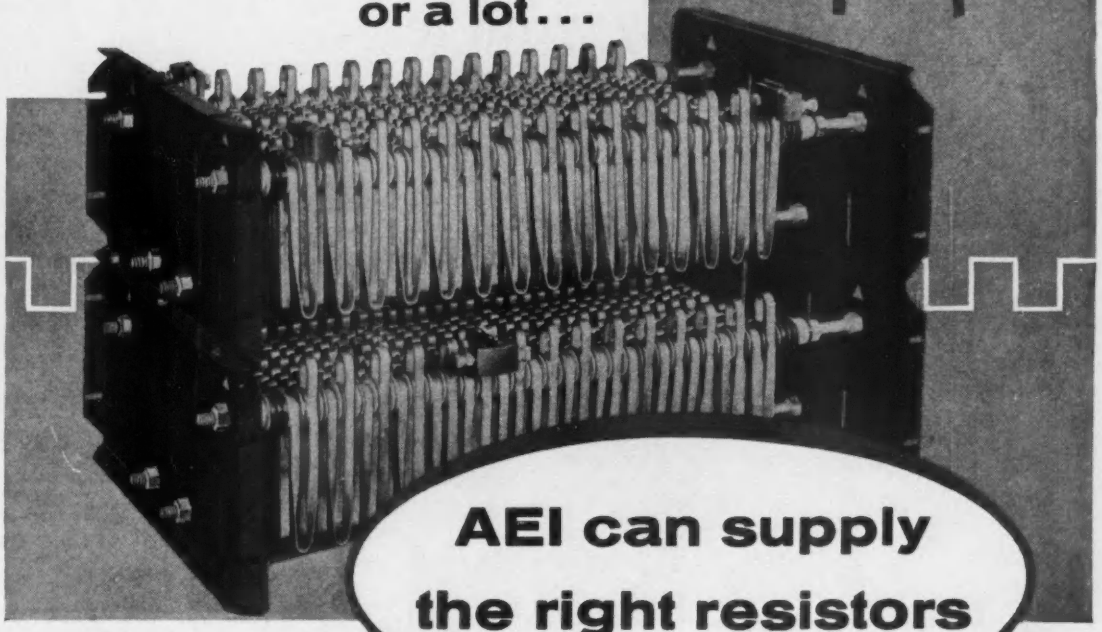

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"PLEASE REMEMBER GENEROUSLY WHEN BUYING YOUR POPPY"

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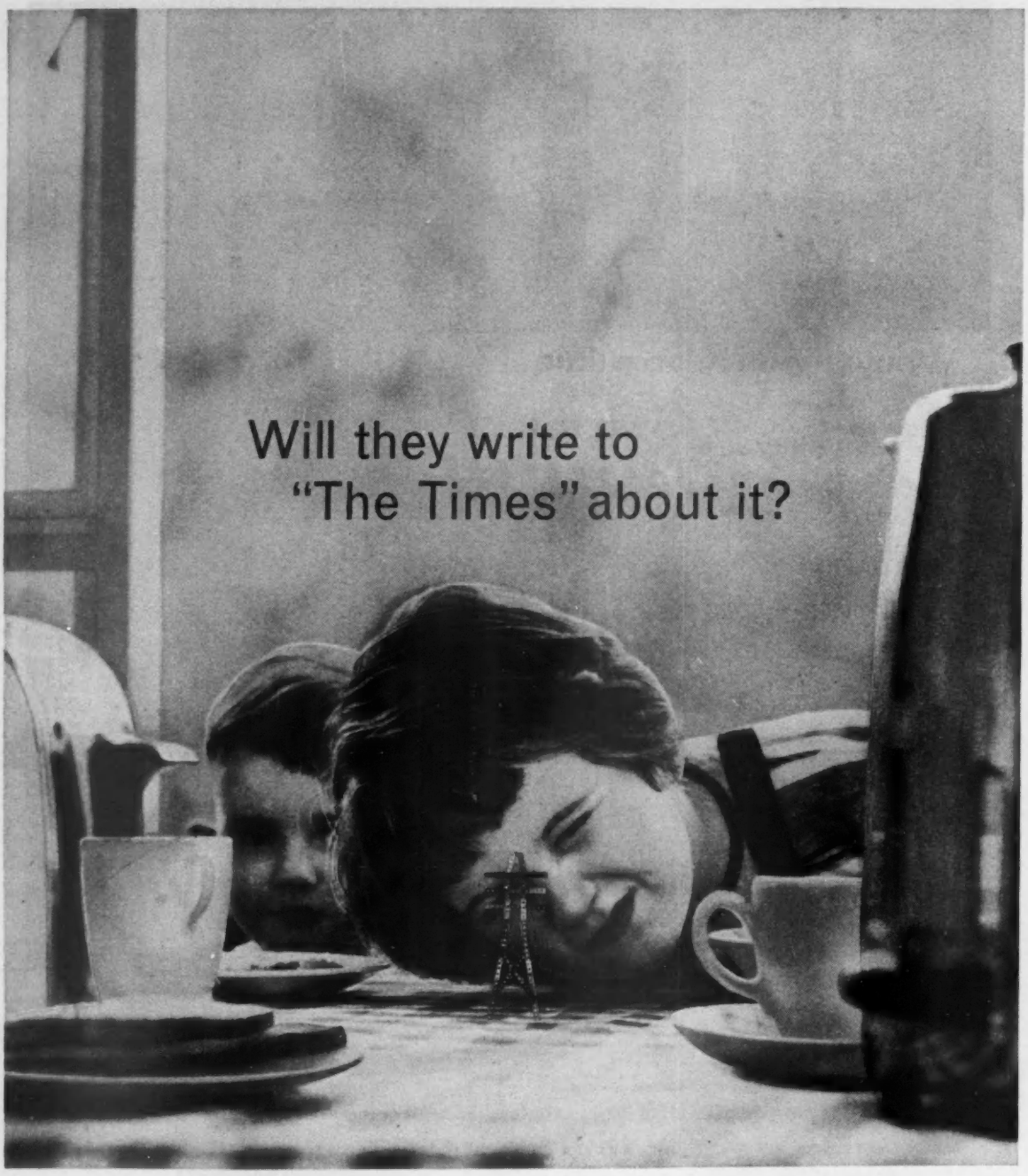

By the time these children are ten years older, Britain's power demands will have doubled. But the number of transmission towers will *not* have doubled. On the contrary — because the Central Electricity Generating Board is adopting 400,000 volt transmission, fewer new towers will be needed. The new power system will use some existing towers, suitably reinforced, and a limited number of new, slightly taller ones. By Act of Parliament, the C.E.G.B. must provide an efficient, economical electricity supply, while preserving visual amenity as far as possible.

■ **These advertisements are appearing in the farming and country magazines. The Central Electricity Generating Board thank electrical contractors for their co-operation in the past, and know that they will do all they can to preserve the amenities of the countryside.**

CEGB

who make and supply electricity to 12 Area Electricity Boards in England and Wales (which re-sell to consumers) and British Railways.

Write for a copy of "Preserving Amenities" to The Central Electricity Generating Board, 76, Winsley Street, London, W.1

NEWS SHEET

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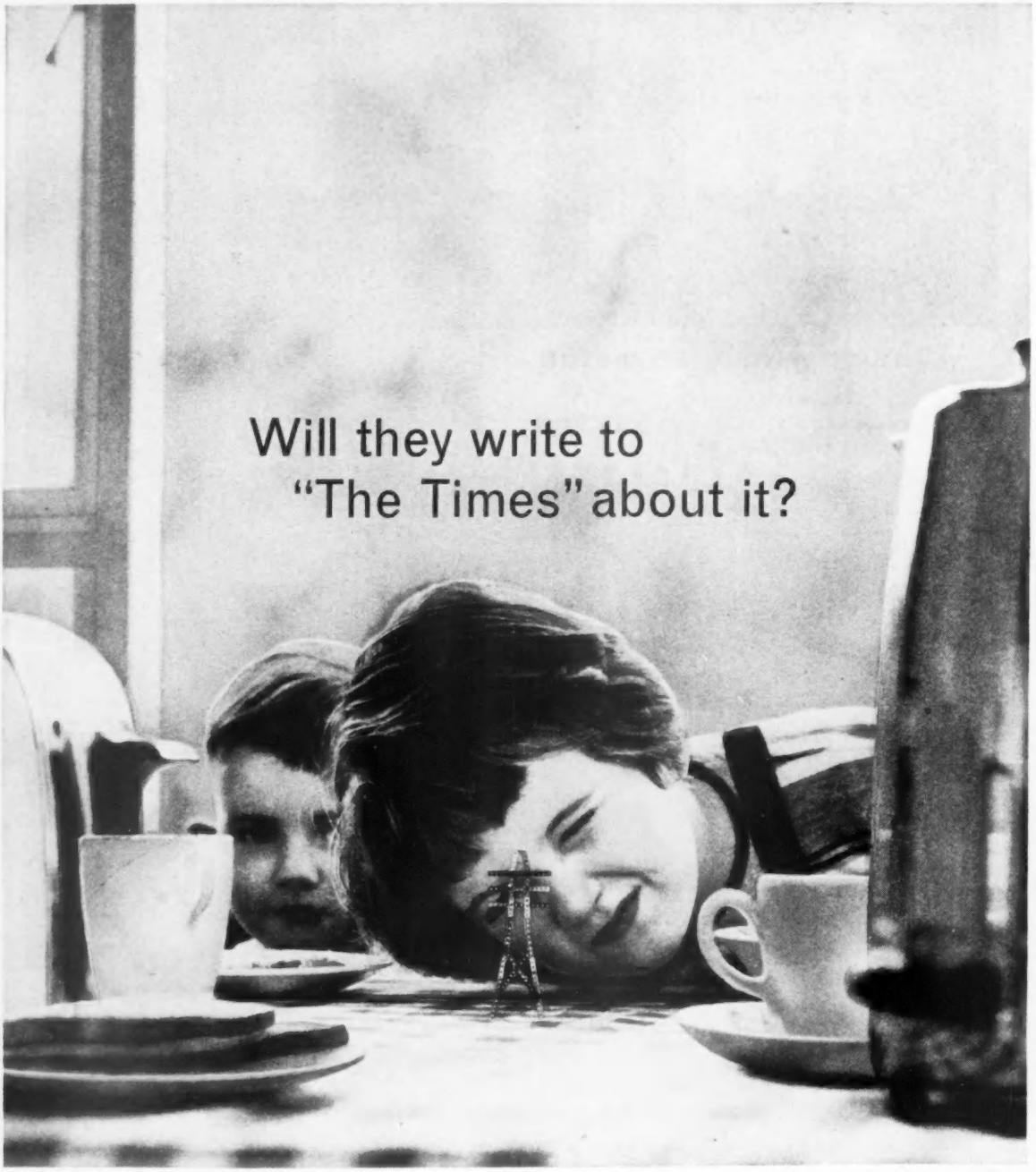

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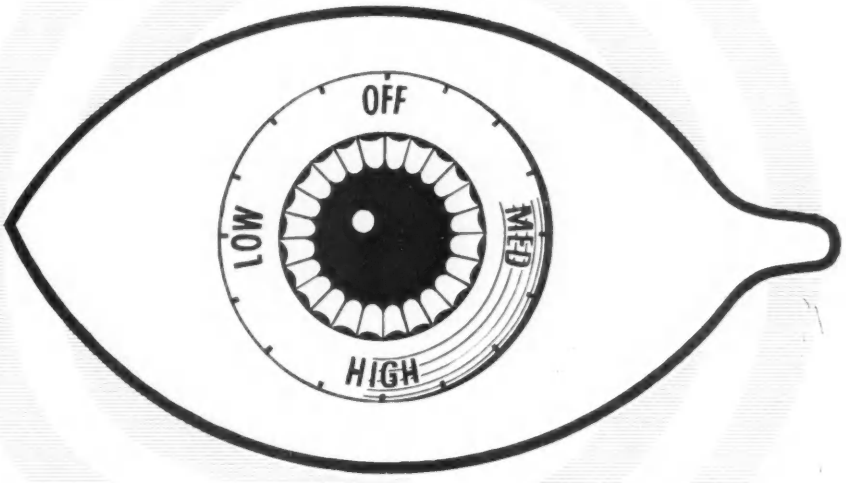

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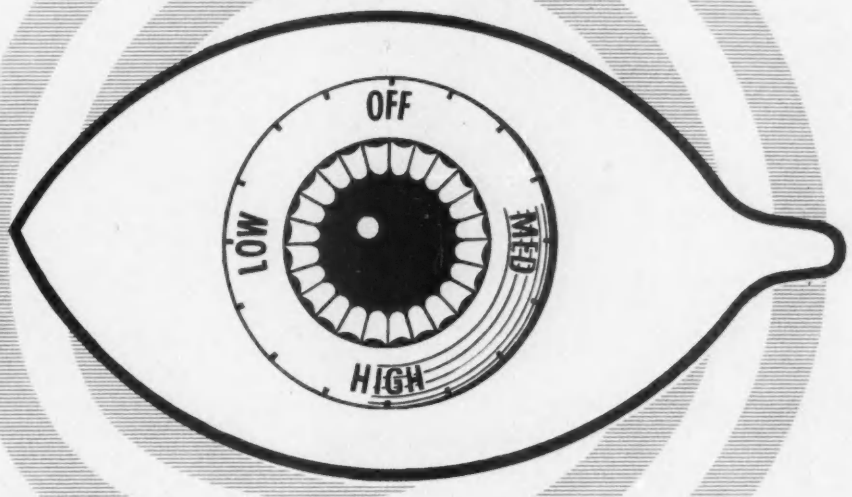

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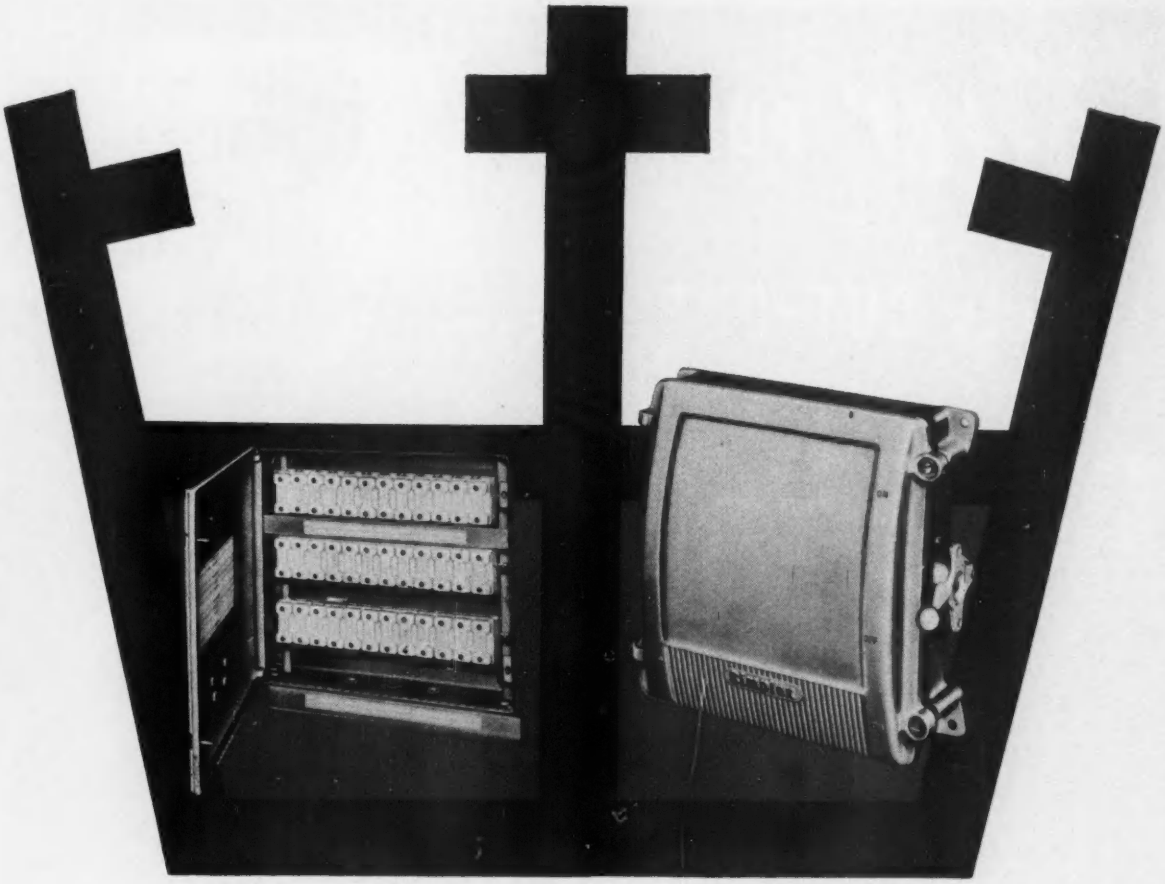

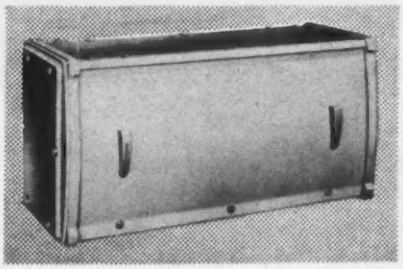

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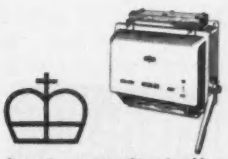

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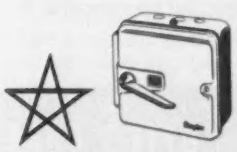

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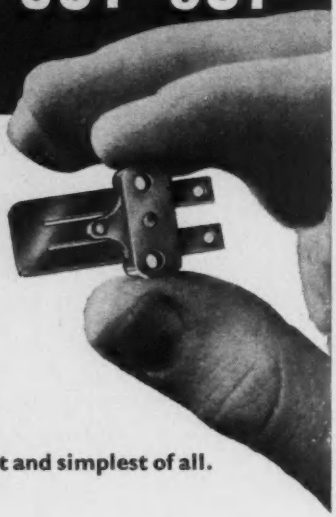

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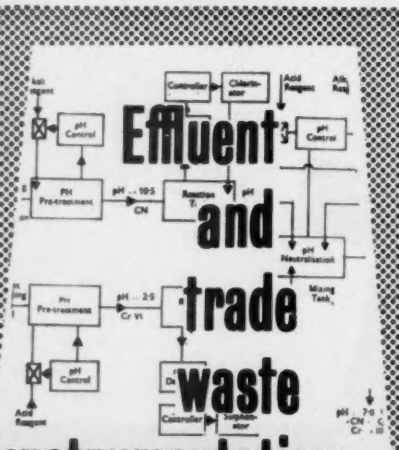

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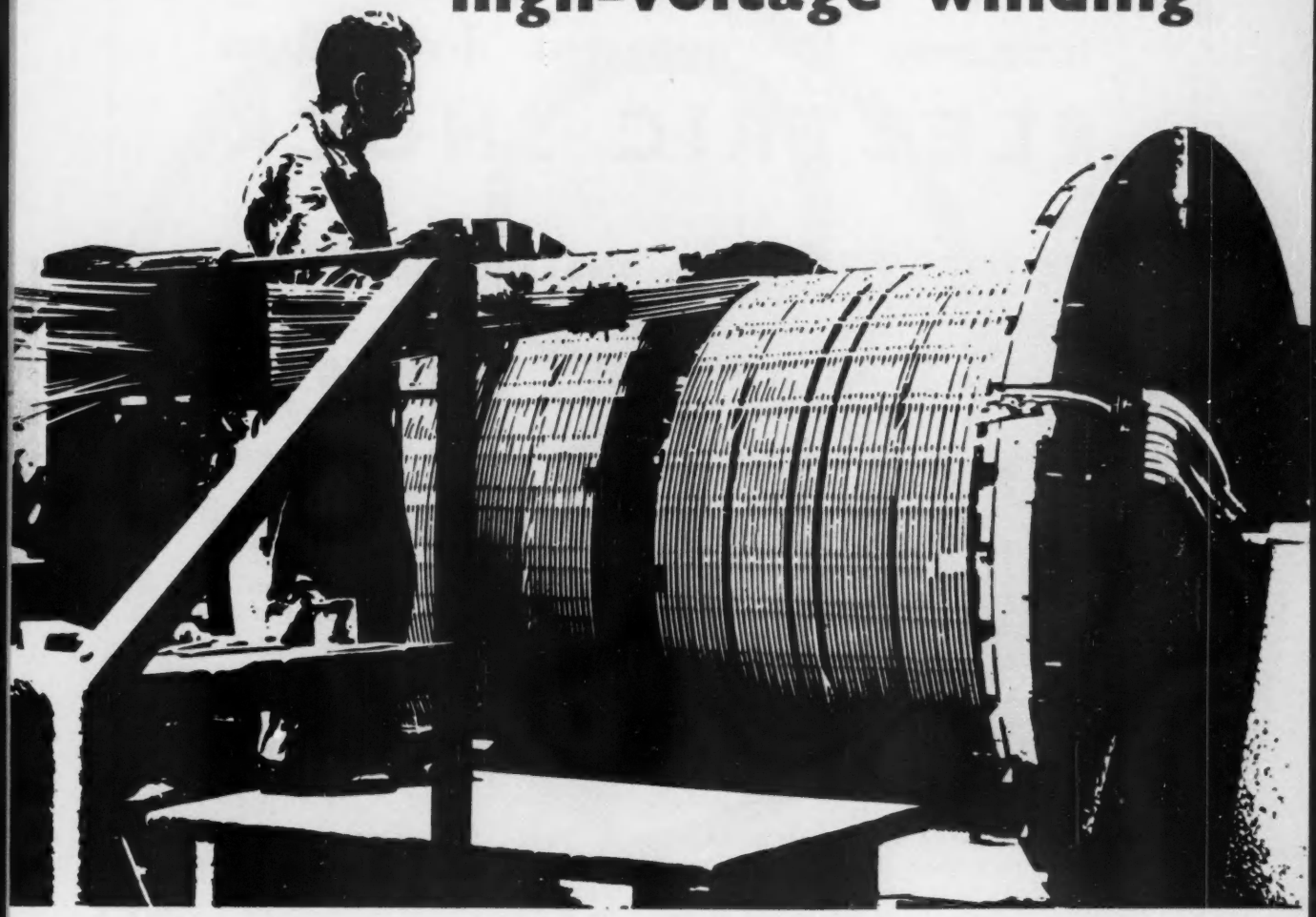

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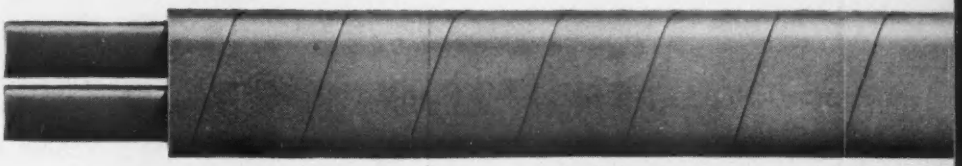

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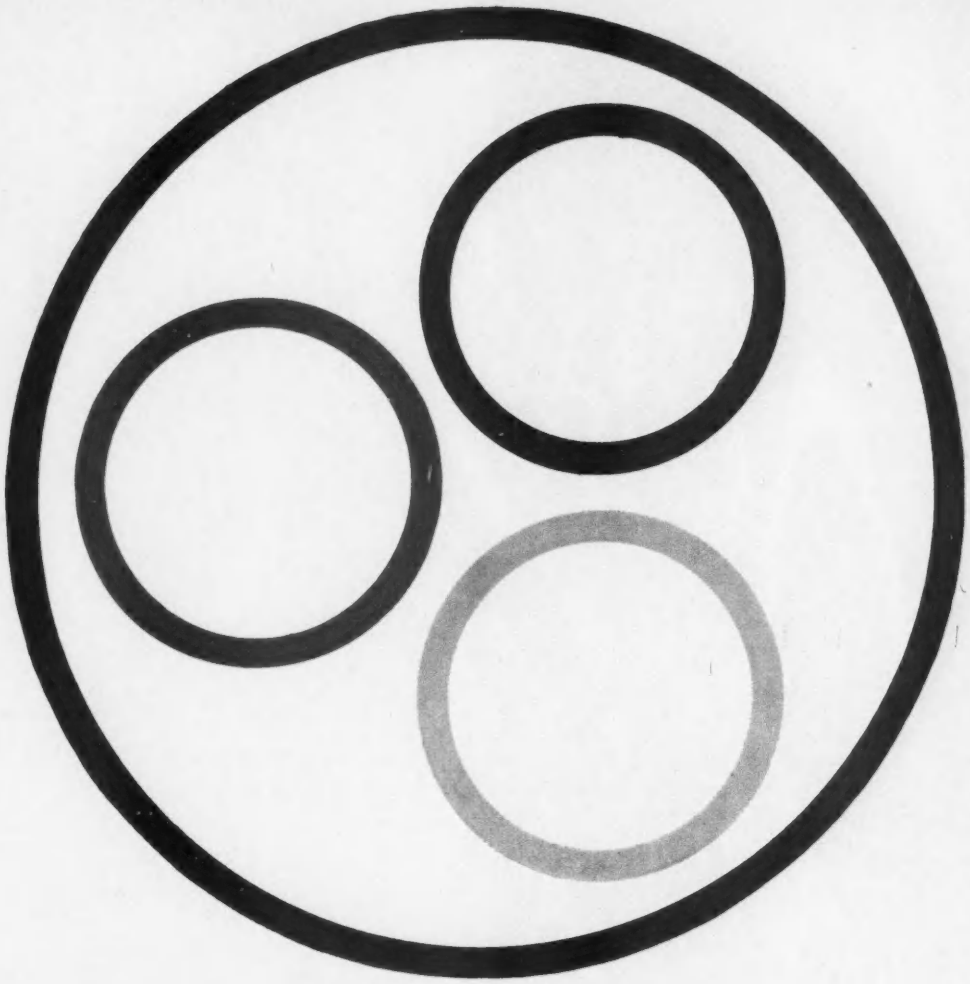

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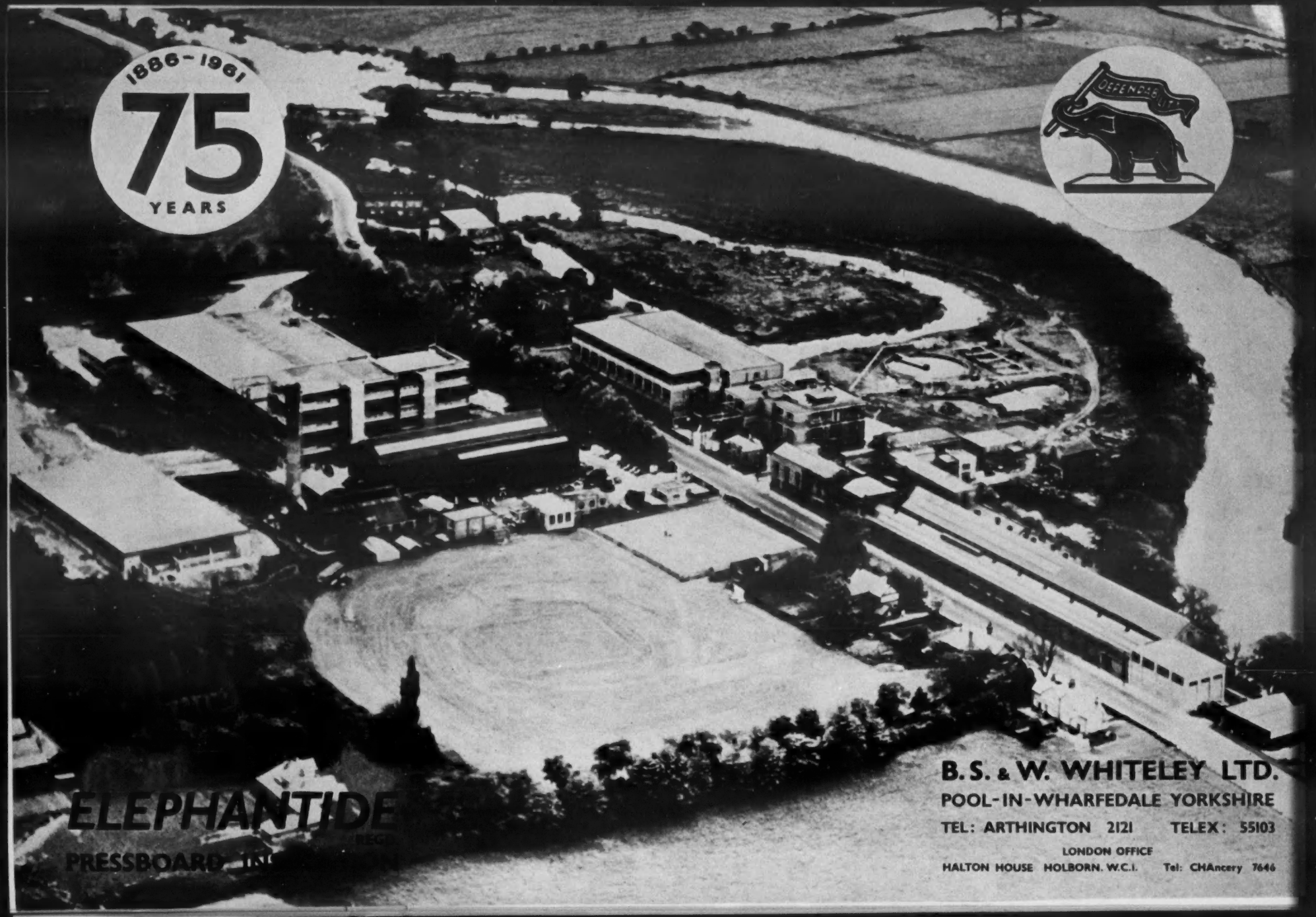
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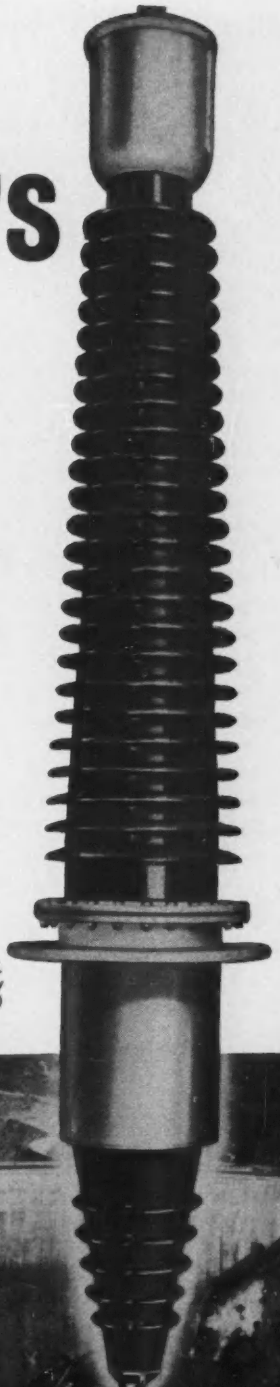
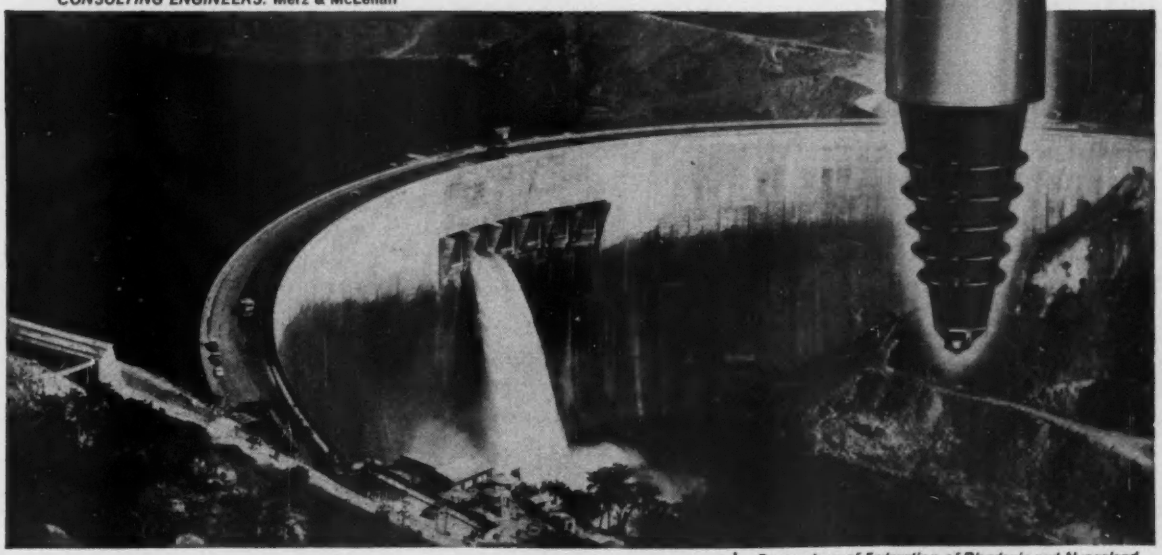


A complete 330 kV. bushing insulator (by courtesy of A.E.I. Ltd.)



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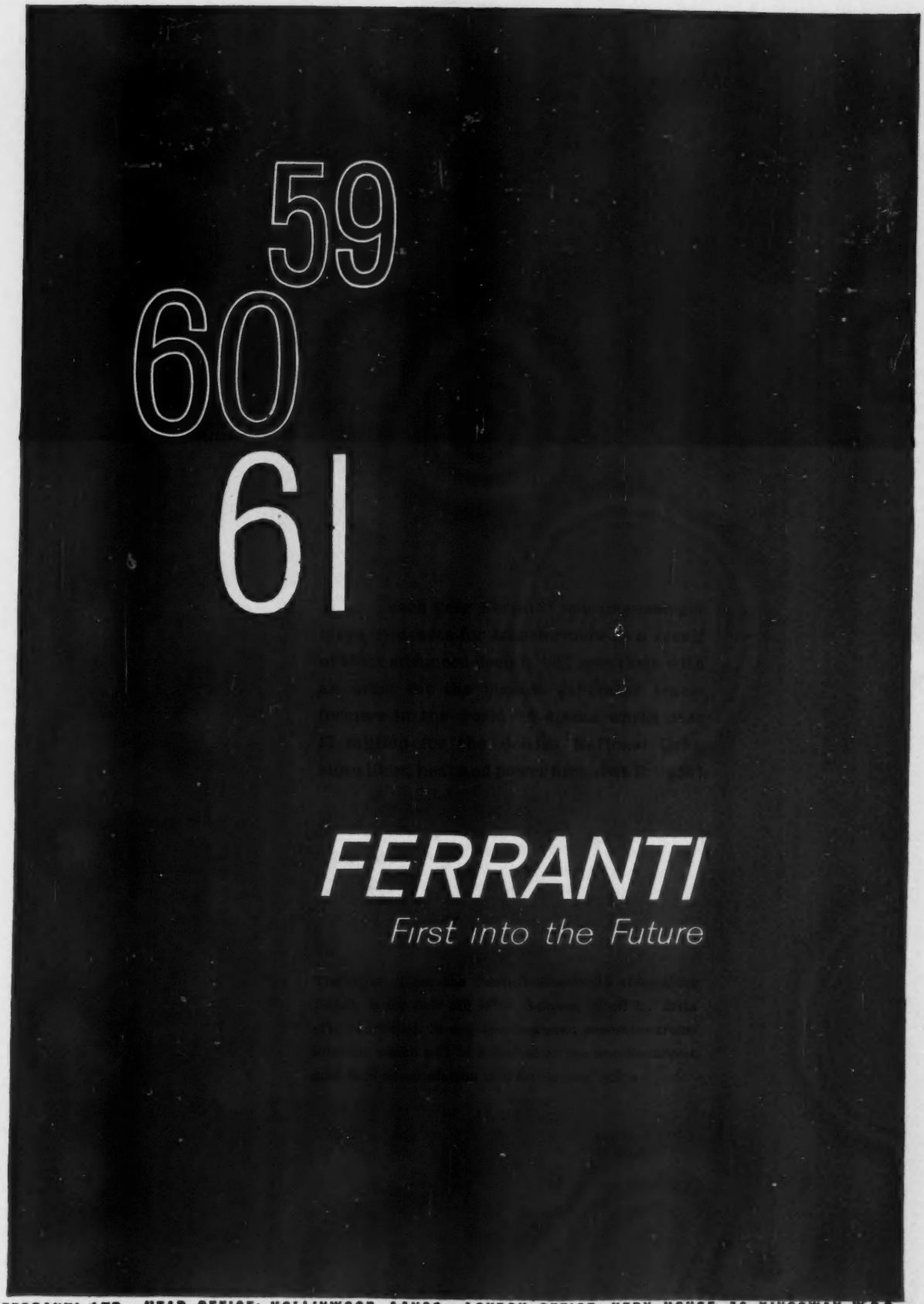

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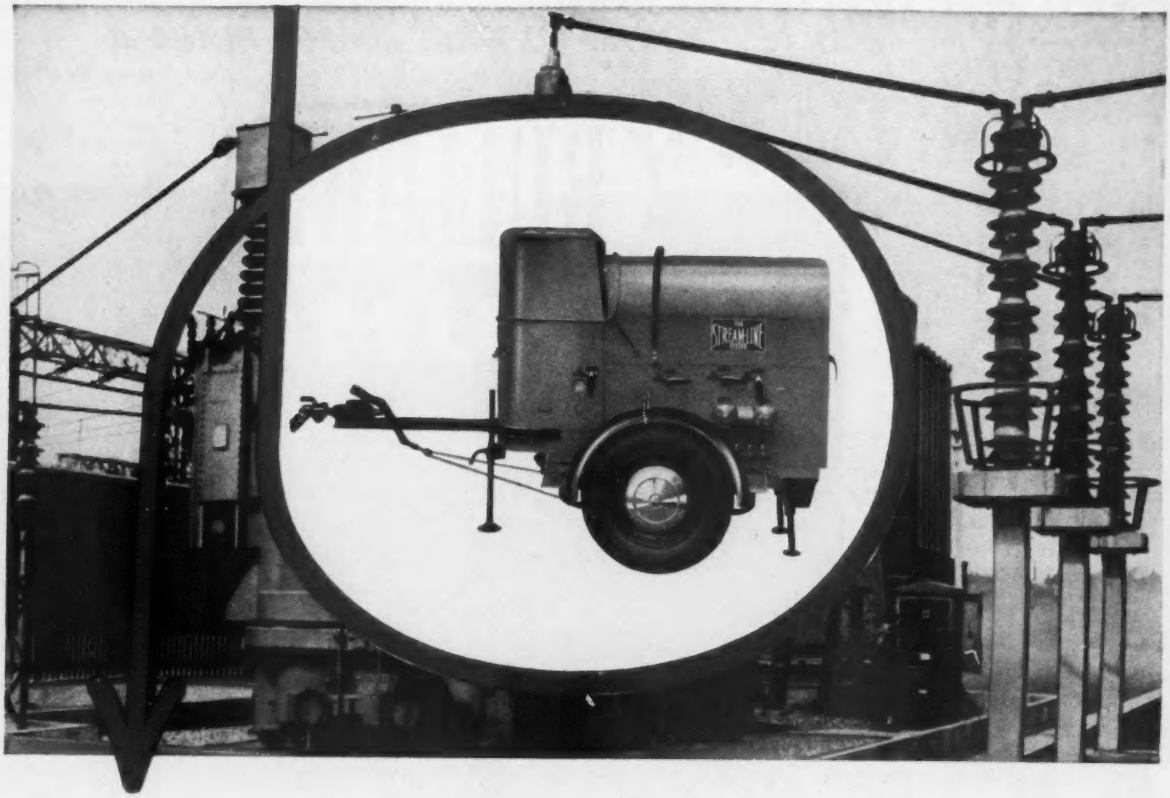
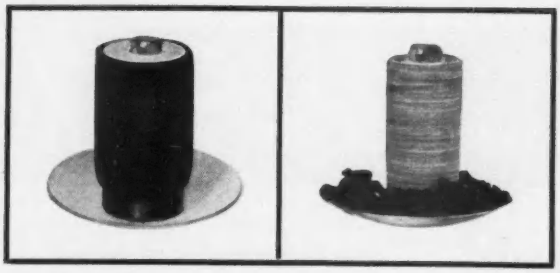


Loop in a Stream-Line filter



These illustrations show the Stream-Line filtering element built up of special paper discs under end pressure. Oil passes through the infinitesimal interstices between the discs leaving solid impurities at the paper edges. Instantaneous cleaning is carried out by a reverse flow of compressed air.

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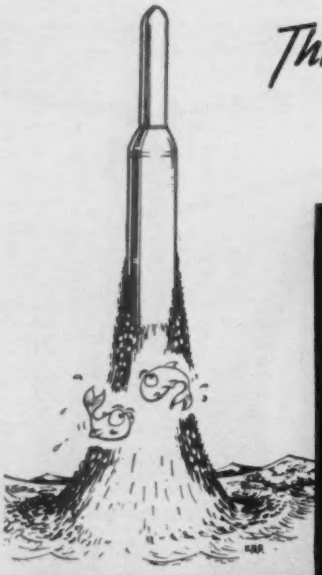

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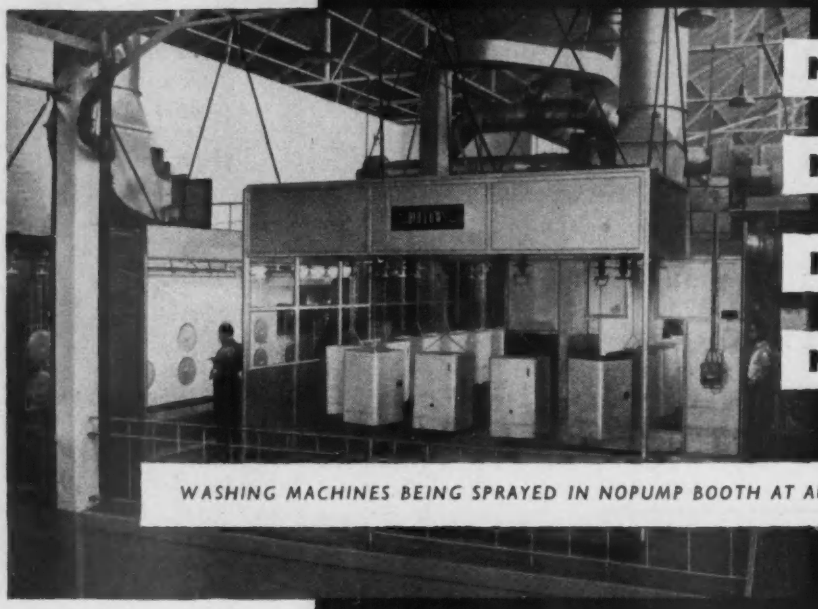

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THURSDAY 2 NOVEMBER, 1961
Registered as a Newspaper Volume 140 No. 18

ELECTRICAL TIMES

SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2
Telegrams: Equivolt .Estrand Telephone: HOLborn 6016

Dans ce numéro

Condensateurs pour moteurs à courant alternatif 637

Dans un moteur à démarrage par condensateur, le choix de la capacité du condensateur influence la torsion et le courant de démarrage. Au stade de l'étude, on peut déterminer la capacité la plus adéquate au moyen d'un cercle-diagramme se fondant sur une équation mise au point à l'origine par W. J. Morrill. D'autres aspects de l'etude sont examinés, et l'on propose de simples règles pour le rebobinage des moteurs à démarrage par condensateur, et pour la détermination de la capacité nécessaire du condensateur.

Appareils électriques de chauffage par accumulation 643

Des essais ont été effectués sur des appareils de chauffage à 'bloc' d'accumulation de chaleur pour le chauffage des maisons. Les maisons comprennent un salon et trois chambres à coucher. Elles étaient équipées d'appareils de 3 kW avec 'bloc' dans le salon, et de 1 kW dans la cuisine et l'entrée. Les appareils à bloc d'accumulation n'étaient alimentés que pendant les heures creuses. La demande de consommation s'éleva à 4.500 kWh par an pour la chauffage pendant les heures creuses et à 2000 kWh pour le chauffage supplémentaire par des radiateurs électriques. On obtint dans le salon une température minimale de 15,5°C, et de 18,3°C au moins tard dans l'après-midi et la soirée.

Tôles d'acier pour les machines électriques 645

Un fabricant se sert de tôle d'acier laminée à froid et ayant des propriétés magnétiques non-directionnelles pour le circuit magnétique des machines rotatives. La perte électrique spécifique de la tôle est semblable à celle de la tôle laminée à chaud dont on se sert dans les transformateurs, mais cette tôle comporte le degré élevé de fini de surface et la faible variation d'épaisseur des tôles laminées à froid. Elle permet de construire des machines rotatives ayant des noyaux serrés et uniformes.

In dieser Nummer

Kondensatoren für Wechselstrommotore 637

Bei einem mit Anlasskondensator versehenen Motor beeinflusst die Kapazitanz des Kondensators sowohl das Anfahrdrehmoment als auch den Anlassstrom. Bei der Konstruktion kann dieser Kapazitanzwert am besten mit Hilfe eines Kreisdiagramms, das auf einer ursprünglich von W. J. Morill entwickelten Gleichung fusst, ermittelt werden. Es werden auch andere konstruktionswichtige Gesichtspunkte erörtert, wobei einige einfache Regeln für die Neubewicklung von mit Anlasskondensatoren ausgestatteten Motoren und für die Ermittlung der erforderlichen Kapazitanz angegeben werden.

Elektrische Speicherungsheizer 643

Es wurden Versuche mit Wärmespeicherungsheizern für den häuslichen Betrieb unternommen, die mit Speicherziegeln arbeiten. Die Versuchshäuser umfassten ein Wohnzimmer und drei Schlafzimmer. Im Wohnzimmer setzte man Speicherziegelheizer einer Leistung von 3 kW ein, und in der Küche und der Vorhalle solche von je 1 kW. Diese Speicherungsheizer wurden lediglich ausserhalb der Spitzenlastperiode betrieben. Dr Heizbedarf erwies sich als 4500 kWh pro Jahr ausserhalb der Spitzenlastperiod und 2000 kWh für Zusatzbeheizung mittels elektrischer Heizvorrichtung des Strahlungstyps. Dies ergab eine Minimaltemperatur von 15,5°C, wobei die Temperatur am Spätnachmittag und abends im Wohnzimmer mindestens 18,3°C betrug.

Stahlblech für elektrische Maschinen 645

Magnetisch ungerichtetes, kaltgewalztes Stahlblech wird von einem Hersteller für den magnetischen Stromkreis rotierender Maschinen verwendet. Die spezifischen elektrischen Verluste dieses Materials sind ungefähr dieselben wie bei dem in Transformatoren verwendeten, heissgwalzten Blech; dagegen besitzt dieses Blech die hohe Oberflächenqualität und die geringen Dickeschwankungen des kaltgewalzten Materials. Bei seiner Verwendung können rotierende Maschinen mit kompakten, gleichmässig aufgebauten Kernen versehen werden.

Capacitors for A.C. Motors 637
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The 'MEMREX-EXEL' Range of Switchgear

Complies with B.S. 2510 · 1954

RATINGS:
SWITCHES 10, 15, 30 AMPS

SWITCHFUSES:
10-15-30-60 AMPS
500 VOLTS

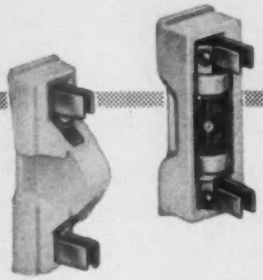
This new range of "Memrex-Exel" switchgear provides one of the most up-to-date and technically advanced ranges of 500 volt industrial switchgear yet offered to the industry. Modern styling, sound technical performance and compliance with all relevant British Standards Specifications are basic essentials.

The cases are of one piece pressed steel with hinged covers, rustproofed and finished grey stove enamel.

Three semi-pierced knockouts are provided at top and bottom and one knockout at left hand side of case for coupling switchgear to adjacent motor starters, etc.

Fuses are of the "Kantark-Exel" pattern the bases of which will accept semi-enclosed rewirable or H.R.C. fuse carriers.

Semi-enclosed rewirable (damper type) patterns comply with B.S.3036:1958.



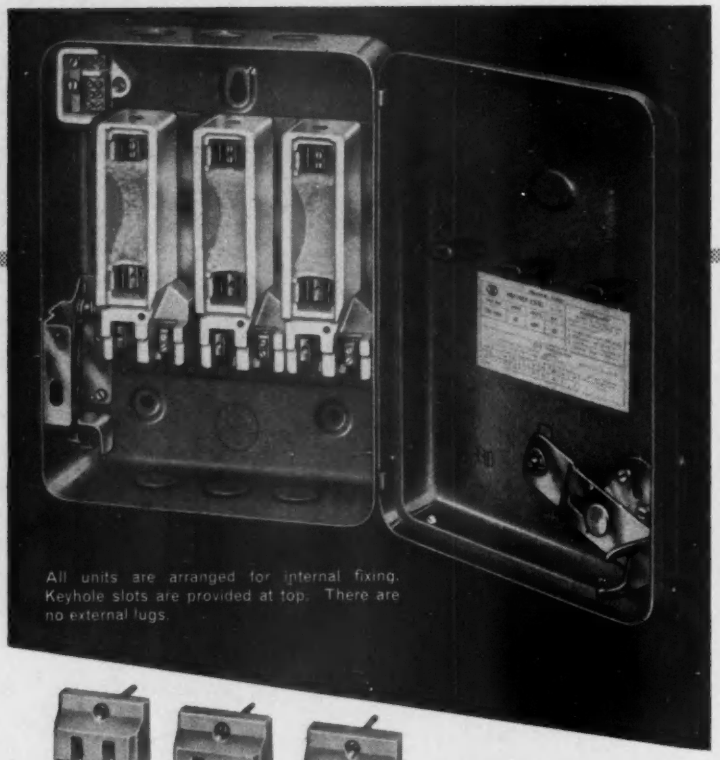
H.R.C. cartridge patterns are interchangeable with semi-enclosed rewirable pattern and comply with B.S.88: 1952.

M.E.M. H.R.C. cartridge fuse carriers are designed to accommodate H.R.C. cartridge fuse-links made to B.S.88: 1952, Appendix 'J' Dimensions, Form A-Offset Tags.

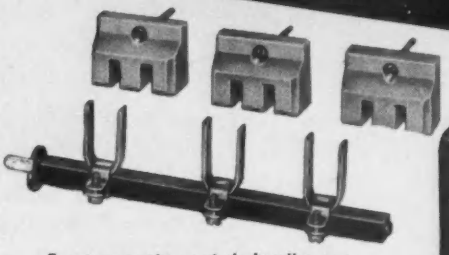
Ample wiring space and a detachable switchbar greatly facilitate the speed of wiring.

All live metal is adequately shielded to avoid accidental contact when cover is open. The porcelain shields also serve as efficient arc barriers.

The range ensures compliance with the most strict interpretation of I.E.E. Regulations (13th Edition) and with the requirements of The Electricity (Factories Act) Special Regulations.



All units are arranged for internal fixing. Keyhole slots are provided at top. There are no external lugs.



Front operating switch handles are fitted on all units to improve appearance and allow for more compact assemblies on switchboards and panels.

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ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 2 NOVEMBER, 1961

Editor and Managing Director
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Joint Editor:
K. C. POUNDS, B.Sc.(Eng.), A.C.G.I., A.M.I.E.E.

News Editor:
T. W. WRIGHT

Comment

ROSES FOR BEAMA

Many vicissitudes can be packed into 50 years, and BEAMA has had more than its share; slump, boom; foreign competition at home, export restrictions abroad; swinging Government controls and, finally, a four-year-long investigation by the Monopolies Commission. BEAMA has survived all to celebrate its fiftieth jubilee this week and has emerged from its latest trials stronger than ever. The spirit of co-operation between electrical firms that has been fostered over the years has become the essential ingredient of the organisation as it is today. The need for such a central body for the industry under the present complex trading conditions is recognised by manufacturers and Government alike, but in the testing times ahead the tenuous bonds of association will be severely tried. Competition has become very much a public watchword; it is right that it should be. However, in this climate of opinion there is every danger of excesses damaging to an industry so dependent on technological development. This trend has to be viewed in the wider context of world trading, where British production techniques are matched against those of the newly equipped factories of Western Europe. In its 50 years, BEAMA has seen many changes within the industry; unquestionably, the future holds more to come.

BLOCK HEATER HOPE

Now that imposition of purchase tax has been accepted as the price for domestic use, there is an urgent need for detailed information on the characteristics of block-storage heaters in British homes. An Electricity Council report on a 12-house trial, published last week, provides a promising start. The tenants, who had lived with off-peak block heating for two years, seemed well satisfied with the results and, on the whole, the load characteristics of the all-electric houses based on block-storage heating have proved attractive to the supply industry. But though the results are encouraging, they are far from being conclusive. The range of energy consumption proved so great that the 12-house sample is too small to give averages much meaning. All that can be said is that even the higher figures seem acceptable. More serious still, from the aspect of evaluating the results, tenants have neither had to meet the relatively high first cost of the block heaters, nor to hire the double set of time-switches installed (water-heating switching was different from that for block heaters). Moreover, the houses were provided with heat insulation above the normal level, which again would have increased cost. From the supply industry aspect, an important conclusion is that comfort in the home with relatively simple

block heaters is possible only with supplementary on-peak heating by radiant fires in the evening and with a fairly heavy midday boost. Although ADD results are acceptable at present, the midday boost seems potentially objectionable from system m.d. aspects, and the report concludes that more sophisticated heaters may be necessary. The type that incorporates dampers to permit increased convective output when the consumer wants it, seems the most promising answer. Whether it will extend to the relative complexity of a built-in fan remains to be seen. That there would be advantages is undeniable.

INSTALLATIONS IN CHURCHES

Electrical installations in churches present a considerable challenge to contractors and their operatives. More than in most buildings, there is a demand that cable runs shall not only be invisible; they are required to be arranged so that the need to drill or plug the building fabric is minimised. For Church of England buildings, guidance about wiring installations has for long been offered by the Central Council for the Care of Churches in a form that church government makes mandatory. A new edition of the pamphlet, out tomorrow, reflects changes in wiring materials and practice. It has some features, too, that are worth consideration by engineers responsible for drawing up specifications for other work. Particularly notable is the order of preference in which wiring systems are placed: m.i.c.c., p.v.c.-insulated cable in heavy gauge conduit and p.v.c.-insulated and sheathed. For all the preference for m.i.c.c., there is still plenty of caution called for when it is used in churches. For instance, operatives installing it must have received "an approved course of instruction," though the pamphlet is silent as to just who an aceptable approving authority is to be. When a conduit system is used, it appears that v.r.i. is out—only p.v.c.-insulated cables are acceptable. Unprotected p.v.c.-insulated and sheathed cables are, seemingly, only just tolerated for churches, and there is an ominous note that whatever may be the position elsewhere, it is not necessarily cheaper in this application than m.i.c.c. or a conduit system. On earthing, too, and the connection of lighting fittings, the code makes requirements beyond compliance with the IEE wiring rules. Church work is meant to last, even in these days. In view of the quality imposed by the pamphlet, the recommendation for annual tests after five years' service and biennial tests before seems positively prodigal.

LIMITS ON RESEARCH CO-OPERATION

The case for co-operation in engineering research has been made frequently in recent years. Success in overseas markets and active technical advance over a broad front is more readily gained if industrial firms avoid duplicating expensive investigations. The theme is tackled again by the president of the Institution of Mechanical Engineers, Sir Kenneth Hague, but he includes in his general endorsement of the theme a realistic restatement of the "trade secret" approach that must affect co-operation in a commercial world. The stumbling block is the generally unsatisfactory situation, as Sir Kenneth sees it, regarding patents. His experience in the boiler-making industry leads him to doubt if the trouble and expense involved in taking out a patent is worth while. A new idea or discovery is more likely, he thinks, to pay off if it is developed speedily without worrying about patent protection. As a result, any ideas that appear to be new to the engineer or research worker involved will be developed secretly, not thrown into the co-operative pool. The answer to this situation is the reduction of the number of ideas which are mistakenly thought to be new. If several firms are working secretly on some basic scheme they would have gained by co-operating on it. This, Sir Kenneth argues, is the path by which life is breathed into industrial research associations. He extends his thoughts in this field to the problem posed by the large nationalised industry customer, which also wants to undertake research. Here, his preference seems more debatable. It is to align the nationalised industry research with DSIR in undertaking long-term basic research, reserving most of the short-term and applied research for the research associations and the manufacturers. This would seem an argument for the major risk-taking to fall on centralised funds, a development not likely to be universally acceptable.

LIGHT ON THE LAMPHOLDER

Long has the humble lampholder been content to hide its light under a lampshade. In shape it is basically unaltered since the days of the carbon filament; the only revolutionary change came with the advent of plastics, when brown bakelite took on itself the former tradition of blackened brass. Is it not time that devotees of industrial design took a hand? This is becoming a matter of urgency now that lamp makers are introducing new shapes which provide the simple lines of modern décor without need for any concealing shade. Such elegance must perforce adjoin a lampholder. Soft light shines on this squat rotundity, with a ring of lampcap brass peeping beneath like the fringe of Georgian pantalets and with perhaps a fray of flex above. If lamps are to become an essential part of modern decoration, then holders must equal them in design, no easy task with a small functional accessory, but it is surprising what can be done with a few extra per cent of moulding powder applied in the proper place. No doubt it will be felt discreet to hide the union with the lamp beneath a skirt (they are worn shorter now than in the H.O. days) and colours bright and gay should cure the 70-year-old inferiority complex. Then, who knows, it may become the custom to change lampholders with each new decoration scheme.

Meteor

This week's quick summary of electrical news faces advertisement page 16

Capacitors for a.c. motors

DESIGN ASPECTS FOR CAPACITOR-START TYPES

by P. B. Greenwood, B.Sc.(Eng.), A.M.I.E.E.*

A CAPACITOR-START motor is defined as a single-phase a.c. motor in which the capacitor winding is in circuit only during the starting period. The purpose of this article is to outline factors controlling the choice of capacitor for such a motor and the calculation of turns ratio in the main and auxiliary windings to obtain satisfactory performance from the capacitor. References are made to papers containing rigorous analytical treatment and design procedures for capacitor starting windings, but, in the main, the subject is discussed in a general, non-mathematical way.

Almost all modern capacitor-start motors below 5 h.p. employ electrolytic capacitors. The exceptions include motors required for frequent starting, or for starting loads of high inertia which prolong the starting period beyond the recommended maximum for electrolytics. For these motors larger and costlier paper-dielectric types are used.

The A.C. Electrolytic Capacitor

The non-polarised electrolytic capacitor was developed in the 1930's, and soon revolutionised the commercial importance of the capacitor-start motor. It is now used universally in capacitor-start f.h.p. motors and in the majority of single-phase motors up to 3 h.p. Two sheets of aluminium foil are separated by paper impregnated with an electrolyte, and wound into a coil. An oxide film is then formed by electrolysis on each foil, this film becoming the extremely thin dielectric. Large values of capacitance occupying comparatively small space can be produced at a fraction of the cost of paper dielectric capacitors.

It will be seen later that the voltage across starting capacitors is sometimes greater than the mains voltage and the most frequently encountered voltage ratings of electrolytic capacitors are 275 V (for use primarily with 200-250 V motors) and 150 (for motors operating on low voltages). 350 V capacitors are also available, and are often specified for integral horse-power motors.

All these capacitors are intermittently rated, usually on the basis of 60 start-seconds per hour, the maximum duration of a start being 3 seconds. If it is desired to increase the duration or frequency of starts above these values, the motor designer can do so by ensuring that the voltage impressed on the capacitor is less than its rated voltage. The time rating can be increased inversely as the square of the voltage, thus at 70% rated voltage the number of start-seconds per hour can be increased to 120, with a maximum duration of 6 seconds per start.

A.C. electrolytic capacitors are available in sizes from 20 mfd to 200 mfd at 275 V rating, and from 75 mfd to about 600 mfd at 130 V rating. Their nominal capacitance values are subject to a tolerance of about 30% and they have a power factor of the order of 10%.

Because of this fairly high power factor, an electrolytic capacitor has, in effect, a small but appreciable series resistance, r_c, which must be added to the resistance of the auxiliary winding, r_a, to obtain the total effective resistance of the auxiliary circuit, r_{ac}.

* Brook Motors Ltd., Huddersfield.

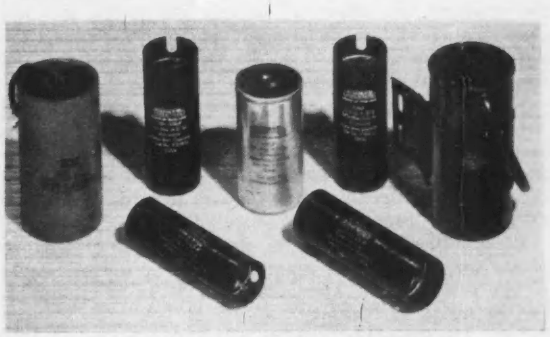

Fig. 1. A representative selection of capacitors designed specially for capacitor-start motor duty (Brook Motors Ltd.)

Locked Rotor Torque Equation and Circle Diagram

W. J. Morrill[1] has evolved the following equation for the starting torque of a single-phase motor:

$$T = 2\alpha r_2 I_m I_{ac} \mathrm{Sin}(\theta_m - \theta_{ac})$$

where T = Torque in synchronous watts
α = ratio, effective aux. turns/main turns
r_2 = rotor resistance, referred to main winding
I_m, I_{ac} = currents in main and auxiliary winding
θ_m, θ_{ac} = phase angles of I_m, I_{ac} relative to line volts

Assuming that the main winding design has been fixed (from considerations of running performance) the only three variables in the above equation are α, I_{ac} and θ_{ac}, the last two being dependant not only on α, but on the value of C, the capacitance.

Now it is found in practice, over a wide range of h.p. ratings at different polarities, that the turns ratio α is fairly constant for capacitor-start motors of normal design and has a value of about 1·0 to 1·2. Let us, therefore, fix α and consider the effects of varying the capacitance.

The effect of this variation is best shown by means of the circle diagram in Fig. 2, taken from a paper by C. G. Veinott[2] and based on the earlier work of Morrill.

In the circle diagram the main winding current is represented by the vector OA, which is constant and therefore fixes point A. Vectors OC′ and AC each represent the auxiliary current and, as the capacitance is varied, the loci of C and C′ are two similar circles, of which only the locus of C is shown. The diameter is AB, which is the maximum value of $I_{ac} = V/r_{ac}$ occurring when x_c, the reactance of the capacitor, exactly balances x_a, the reactance of the auxiliary winding.

OC obviously represents the total starting current in the line and the length of the perpendicular CE from C to OA represents the torque, since it equals AC sin AOC′;

that is to say, I_{ac} sin $(\theta_m - \theta_{ac})$, the only variable part of the Morrill equation.

Maximum starting torque occurs at the point D, where the tangent is parallel to OA. The maximum starting torque per ampere occurs when C occupies the position such that OC is a tangent which is, in fact, the position indicated in Fig. 2.

A further interesting condition is obtained at the point G, which gives minimum starting current, this being even less than I_m. Because of the very low torque at this point, however, it has no practical importance.

Any of these points can be determined from the diagram, so obtaining the values of I_{ac}, θ_{ac} and hence the nett reactance x_{ac} of the auxiliary circuit. Since x_{ac} equals the difference between x_a and x_c, the value of x_c follows and hence the starting capacitance.

Obviously, the value of capacitance so calculated and the starting torque produced depend on which point on the locus circle is chosen as the operating point. At A the starting torque and capacitance are zero and both ascend in value as the operating point moves towards D. Beyond D, increasing capacitance produces decreasing torque.

It may be thought that to work at point D, and so obtain the capacitor for maximum starting torque, would be the most suitable approach. This, however, is not so for the following reasons:

(a) The capacitor tends to be rather large and costly.

(b) The increase in torque compared with that obtained at point C is too small to justify either the additional capacitance or higher starting current.

(c) Although the starting (locked rotor) torque is a maximum at point D, the accelerating torque above half-speed tends to be lower than that obtained by using somewhat smaller capacitance. This is discussed more fully later.

Capacitor Voltage

For the above reasons, maximum starting torque is not the best criterion for the designer; more satisfactory all-round results are generally obtained by using point C, using a smaller capacitor and obtaining maximum torque per ampere of starting current.

This must be carefully watched, as it must be kept below the rated voltage of the capacitor, preferably by about a 20% margin. Its value at starting is I_{ac}/x_c. As the motor accelerates, the capacity voltage at first falls slightly and at higher speeds begins to rise again. If the auxiliary winding was to be left in circuit until free-running speed was attained, the voltage would begin to rise sharply at about 80% synchronous speed and reach a value much higher than that at start. Provided that the centrifugal switch is set to open at about 70% to 77% synchronous speed, the capacitor voltage is not likely to appreciably

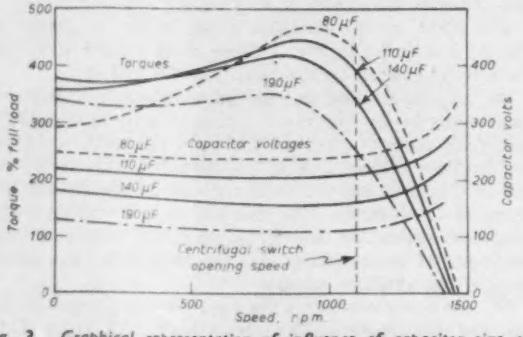

Fig. 3. Graphical representation of influence of capacitor size on starting performance in a ½ h.p. four-pole capacitor-start induction motor

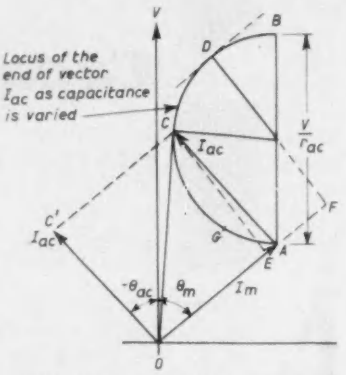

Fig. 2. Circle diagram for determination of torque/capacitance/turns-ratio relationships

exceed the starting value. This is illustrated in Fig. 2, which shows also that the larger the capacitor, the smaller is the capacitor voltage.

Accelerating Performance

The graphs in Fig. 3 show the influence of capacitor size on the starting performance right through from stand-still to beyond the normal switch-opening speed.

Note that the 140 mfd capacitor, though it gives maximum starting torque, produces less accelerating torque as the centrifugal switch operating speed is approached. The 110 mfd capacitor would be a better choice, this being approximately the size giving maximum torque/ampere. Note also that, while the 190 mfd capacitor gives only a little less starting torque than the 140 mfd, it produces by far the lowest accelerating torque of the four sizes shown.

When it is considered that the starting current increases with capacitance, it is clearly undesirable to exceed the value of the capacitance which gives maximum starting torque and, indeed, it is preferable to select a value about 20% smaller.

Effect of Varying the Turns Ratio

So far, a fixed number of turns has been assumed and we have considered the effect of varying the size of capacitance. Let us now consider the effect of varying the turns ratio α by changing the number of turns in the auxiliary winding.

From the Morrill equation on first consideration it may be imagined that a decrease in α would result in a decrease in torque. However, a change in α will also affect the value of I_{ac} which also appears in the formula, and an easier visualisation is again afforded by Fig. 2. Since the maximum available torque is represented by the length DF of the perpendicular from D to OA, this can be increased by increasing the diameter AB, which means reducing r_{ac}. This reduction in the auxiliary turns (hence reducing α) *increases* the maximum torque available. If the reduction in turns permits an increase in the gauge of wire so much the better, as r_{ac} is further reduced.

The reduction in turns causes a reduction in x_a, which is proportional to α^2, and in order to keep the point C at the same optimum position on the circle, x_c must be reduced approximately in the same proportion and so C must be increased. Reducing α therefore requires an increase in C proportional to α^2, which will result in improved starting torque, and vice versa.

Influence of Supply Voltage on Capacitor Selection

If two motors of the same frame and core design but required for different supply voltages are to have the same running performance, the volts/turn in the main windings

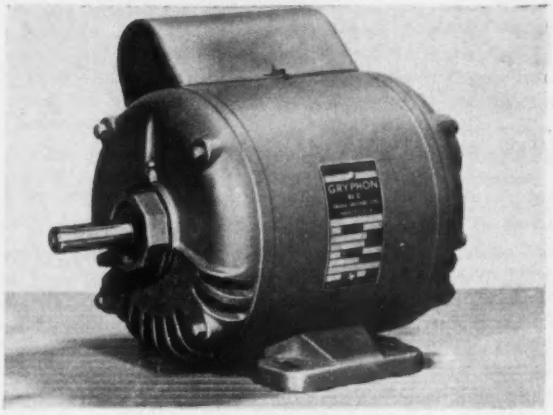

Fig. 4. A typical ½ h.p. two-pole capacitor-start motor of the type to which the article refers (Brook Motors Ltd.)

must be equal. To give the same starting performance, the ratio α should also be the same; therefore, to keep the same relationship between x_a and x_c the capacitance should be in inverse ratio to the squares of the voltages.

Logically, therefore, a 240 V motor could employ a capacitor with 23% less capacitance than a 210 V motor. In practice, however, most manufacturers prefer to standardise on one size of capacitor for motors in the same frame, but wound for different voltages within the range of, say, 200 V to 250 V. The ratio α would then be made 12% smaller in the 240 V motor than in the 210 V motor, and it would have a somewhat better starting torque.

For a motor required to operate on 115 V, however, the capacitance would certainly be increased to a value about four times that used for supplies in the 200 V to 250 V range but, of course, a 150 V-rated capacitor instead of a 275 V may be used.

Motors of 480 V are treated rather differently. Electrolytic capacitors of 550 V rating are not available; therefore, the auxiliary circuit is connected across half the running winding and designed as if for a 240 V motor.

The capacitors tabulated below may be considered as the minimum and one may find anything up to double these values being selected in practice to achieve generally acceptable starting performance.

H.P.	*200-250 V*	*110-120 V*
0·25	30 mfd	125 mfd
0·33	45 „	175 „
0·5	60 „	225 „
0·75	75 „	300 „
1·0	100 „	400 „

Use of a Capacitor with a Split-phase Motor

Occasionally it is found that a split-phase motor, after installation, has insufficient torque to start satisfactorily. The question then arises—can any improvement be obtained by the use of a capacitor?

The answer is "Yes," but the capacitance required is likely to be considerably greater than that used in a normal capacitor-start motor. This is because the turns ratio α is much smaller (well below unity) for a split-phase motor. There is a certain capacitance value which will give just the same torque as when the motor is operated split-phase but with a much reduced starting current. Anything less will give a lower torque, and anything larger will give an improved torque.

Finally, a simple approach to the problem faced by a rewind shop wishing to rewind a split-phase motor for capacitor starting, "How many turns and what size of capacitor?" The following rules should give adequate results.

(a) Wind the auxiliary winding with about 10% more turns than in the main winding, using the heaviest wire gauge that the winding space permits. Distribute the turns in a similar manner to the split-phase auxiliary winding.

(b) If a selection of capacitors is available, find by tests the capacitance which will give maximum torque and select a value 20% smaller. Otherwise use a capacitor 50% larger than given in the table.

(c) Check that the capacitor voltage does not exceed its designed rating.

REFERENCES

1. Morrill, W. J.: "The Revolving Field Theory of the Capacitor Motor," *Trans. AIEE*, 1929, p. 614.
2. Veinott, C. G.: "Starting Windings for Single-phase Induction Motors," *Trans. AIEE*, 1944, p. 128.

Local or Circuit Fusing

IN the early days of electric wiring, a pair of heavy mains were laid in wood capping and casing. Lighting only was the electrical load in those days and the various points were fed by tee-joints taped off the mains to form what came to be known as the "tree system." Local fusing was then provided by cut-outs *en route*, often difficult to locate at a later stage, or sometimes inside china ceiling roses.

As a revulsion against "fuses dotted all over the show," British installation engineers firmly turned their backs against this system in favour of circuit fusing, since the distribution fuseboard could be fitted in a definite position, preferably near the meter.

During a recent visit to France, whilst staying at an hotel which had been recently rewired, the author noticed that local fusing for lighting had been given a "new look." It made him wonder as to whether the time had come for some rethinking by British engineers on the subject, since there are many advantages of this type of protection—the more so as local fusing has, in fact, now become part of accepted practice in this country as applied to the 13 A plug.

In hotels or other public buildings, a fault which results in half a dozen rooms being out of commission can have serious repercussions. Even in private dwellings, the plunging of half the house into sudden darkness can be, to say the least, a decided nuisance. In the examples which were seen in France the fuse for each light was accessible, being neatly housed in a flush ivory plastics switchplate. The fuseholder has a serrated cap which easily unscrews, allowing the cartridge fuse to drop out. This has the undoubted advantage of making it impossible to upgrade the fuse by odd bits of wire, etc.

This method has been extended to flex-outlet plates which also hold a fuse for pear-switch light control. The latter, by the way, has a positive flex-grip, a feature which we could do well to copy here. There is also a compact arrangement whereby the fuse is fitted in a round surface tumbler switch. As a point of interest, the French version of the fused plug is not so happy. The fuse controls a 6 A, two-pin, reversible non-shuttered type plug.

We usually frown upon Continental practice but, in this case, the system of a fuse/light point would match the 13 A fuse-plug. It therefore merits the serious consideration of designers and engineers engaged in electrical installation work.—*M. Neidle, Graduate IEE.*

B.E.A.M.A.

HALF-A-CENTURY'S SERVICE TO INDUSTRY

FIFTY years ago from comparatively small beginnings sprung an organisation whose title was to become a password in the electrical industry, the British Electrical and Allied Manufacturers' Association. This began when gas held sway and the future of electricity was hardly a dream; a time when the manufacturing industry was struggling against imperfect technology and commercial difficulties.

The forerunner of BEAMA, the National Electrical Manufacturers' Association, came into being in March, 1902, when a number of firms banded together following a meeting between merchants and manufacturers. At the time, the ELECTRICAL TIMES hailed it as an organisation from which all could profit as it provided for concerted action for the protection and advancement of the industry. Twenty-nine companies formed the nucleus, among them Verity's, GEC, Falk Stadelmann, A. P. Lundberg and Nalder Bros. and Thompson. The first years of NEMA were difficult ones when foreign competition was a major factor in the British market.

The Association was composed of the lighter side of the industry and heavy plant manufacturers continued to resist joining. They were suspicious not only of each other but afraid that if they joined NEMA they would be outvoted by the "small fry." During these years this journal constantly publicised NEMA's case with a view to courting membership of the heavy plant makers. When that support was assured, BEAMA was born. The transitional period was 1911. The inaugural dinner of the organisation was held in October of that year, when Mr S. Z. de Ferranti took the chair and censured manufacturers for trying to destroy each other for an apparent gain which failed to materialise.

In the year the BEAMA was formed

. . . an electrical exhibition at Olympia was hailed as "the greatest event of its kind"

. . . the IEE issued the sixth edition of the wiring rules

. . . the coronation celebrations of King George V and Queen Mary were the occasion for patriotic illuminations using electric lighting

. . . best Admiralty large coal, free on barge into the Thames, cost under 22s/ton

. . . copper was £58/ton, aluminium £68/ton

. . . the SS *Olympic* attracted attention because of the 1,660 kW generating capacity installed

. . . Mr S. Z. de Ferranti began his second year of office as IEE president

. . . GEC used an aeroplane to fly lamps to a customer

. . . Dunston power station was newly operating with 6·5 MW sets, 37·5 klb/hr boilers, 200 lb/sq in. steam

. . . a wave of strikes caused the army and police to be called out to protect power station workers

. . . the electric lighting of the "new variety theatre, the Palladium" merited a description

. . . and even then, there was concern with electrical imports totalling £5·7 million against exports of £2·3 million

. . . about fire brigades attributing fires to fusing of electric wires

. . . about the status of electricians in mining.

The success of BEAMA in its infancy was due, in no small measure, to the personality and efforts of its first director, Mr D. N. Dunlop, who had a wide knowledge of the industry and its requirements. His appointment was acceptable to the new members in the heavy plant field equally with existing members. He was a man of foresight and held firmly to the belief that co-operation in competitive industry could achieve far greater results than mutually destructive competition.

BEAMA in Action

This was a transitional period from the era of the individual engineer to the concept of teamwork in design and manufacture. A time when the theory of electrical machines had still to be fully evolved. BEAMA aimed to foster some order and regulation in trading of its constituent members from the "prevailing confusion of circumstances in the industry." Special attention was given to trading practice and, within three years of its inception, the Association reached agreement with the IEE over the legal conditions of heavy plant contracting. "Model General Conditions," drawn up and published in 1914, were the first standard text of their kind in the world and are still being used in a modified form today.

A notable start was made in the export field in 1915 when committees were set up in India, South Africa and Australia. A year later these were expanded to include Buenos Aires and Moscow. The same year also saw the birth of the *BEAMA Journal*, and special export editions were published in Spanish and Russian to support the committees in Argentina and Russia.

The second decade in the Association's life was one of high hopes and great endeavour as electric power developed on a national scale. Resources were concentrated to promote the conception of electricity's wide uses and the need emphasised for co-operative publicity. In 1920 BEAMA, in collaboration with five other organisations, played a major part in the formation of EDA. The Association then turned its attention to other aspects of publicity and public relations, more especially on behalf of electrical manufacturers.

The year 1924 was notable in the Association's history. First, there was the organisation of a co-operative exhibit at the British Empire Exhibition, Wembley, where the Electrical and Allied Engineering Section took a 3¼-acre site, the largest of any industry. This was also the largest electrical exhibition to have been held at that time. Secondly, there was the World Power Conference, an instance of international co-operation. The organisation of the conference lay largely in the hands of Mr Dunlop and 25 nations participated. The hope became evident that it would lead to greater co-operation both economically and politically.

Standardisation and Research

Standardisation, particularly of electrical machinery, was one of the objects stressed by

BEAMA, and the Association issued standards for the guidance of its members as early as 1913. Later, with the establishment of the Engineering Standards Committee—now the British Standards Institution—these specifications were withdrawn as they became superseded.

Research was also promoted by the Association and work in this sphere culminated in the establishment of ERA. This was done in collaboration with the IEE, CMA, on the one hand, and DSIR on the other. Each side guaranteed half of ERA's income for the first five years. In the technical education sphere, scholarships were established to counteract the shortage of home-trained plant designers. Scholarships ran for several years before curtailment due to reasons of economy.

During this time BEAMA set up a statistical and economic department whose valuable work is going on today. At the time members acclaimed the establishment of such a department and it found favour with contemporary financial commentators.

Depression Years

The 1930s brought with them depression and industrial unrest, together with a high level of unemployment. Heavy plant manufacturers suffered badly and the industry's structure altered with amalgamation and reorganisation. The Association's services were geared to meet prevailing conditions at a time when Mr Victor Watlington joined Mr Dunlop as joint director. He was appointed sole director in 1935. His wide experience assisted the efforts of BEAMA towards the recovery of the industry. Midway through the decade the industry made a good recovery, new products reflecting the changing pattern in the industry and leading to the formation of new sections of the Association.

War brought its problems and, as in the previous hostilities, BEAMA placed its resources at the Government's disposal. The services of the statistical section were made available to the Export Licensing Department and considerable help was given to the newly formed Directorate of Industrial Electrical Equipment in the Ministry of Supply.

The introduction of purchase tax in 1940 presented additional problems and a Purchase Tax Electrical Industry Committee was formed of representatives of manufacturers, wholesalers, contractors and electricity supply. This facilitated the administration of the Act and provided for exchange of views. BEAMA became spokesman for the electrical manufacturing industry and chief negotiator on its behalf on many new questions which arose out of war conditions. This service attracted many firms hitherto outside the Association to apply for membership.

Post-war years, too, brought their problems, and in this transitional period Col B. H. Leeson became director. This was a time when order books for power plant were filled to capacity. Demand for electricity was spreading and there was a shortage of generating and distributing capacity throughout the world.

In the last few years of its history BEAMA faced its most stringent test when it was the subject of a long inquiry by the Monopolies Commission. From this ordeal it has emerged stronger than ever, a tribute to the intangible bonds which bind the industry in co-operative spirit. Under the guiding hand of Mr Stanley Steward, BEAMA faces new problems in the rapidly changing pattern of European and, indeed, world trade. It will be able to meet these with the mutual trust and confidence that has been bred over the last 50 years.

DIRECTORS OF B.E.A.M.A.

DURING FIRST 50 YEAR SPAN

D. M. DUNLOP
1911-1935

V. WATLINGTON
1935-1946

B. H. LEESON
1946-1960

S. F. STEWARD
1960-

Trans-world Telephony

THE chairman of the Electronics and Communications Section of the IEE, Mr R. G. Halsey, C.M.G., B.SC., F.C.G.I., M.I.E.E., chose the subject "Global Communication" for his inaugural address last Wednesday. As Director of Research, Post Office Engineering Department, and a director of Cable and Wireless Ltd., it was one on which he could speak with authority and his listeners were treated to a fascinating survey of the development of transoceanic deep-sea cables since the first was laid by the *Great Eastern* in 1866. Not all were successful for, in the words of Sir Chas. Bright, by the end of the century the first three were "absolutely dead as well as being buried."

During the first half of the twentieth century there was a remarkable swing over from cable to radio communication, the first challenge coming from a commercial radio-telegraph system in 1908 and the first radio-telephone system in 1927. The cable responded to the challenge, but it was not until the opening of the second half of the century that the problems of subscriber access were overcome and the first transatlantic telephone (TAT-1) cable opened for service in 1956. It provided 36 circuits between Scotland and Newfoundland and 60 between Newfoundland and Canada.

Mr Halsey dealt with the different forms of repeater designed in connection with these cables and their successors and the problems which were encountered while laying. Development was in hand concurrently on both sides of the Atlantic and on somewhat different lines, so it is heartening to know that British practice has since been adopted in many ways by later American designers. Not the least of the problems was the design of a cable which would not twist under tension while being lowered to the sea bed. But they were solved in time for the planning of the round-the-world cable, the first section of which will be laid between Sydney and Auckland next year.

The success of the telephone cable over the radio-telephone is due to the troubles of fading which accompany long-range, short-wave transmissions at certain times of the year. Looking to the future, there is a chance that radio communication may return to the attack via reflected signals, or even retransmitted signals, from satellites orbiting the earth a few hundred miles high. The synchronous satellite, orbiting at an altitude of 22,300 miles, will maintain a relatively stationary position to the earth's surface, but the delay between transmitting and receiving of the signal would be of the order of 250 ms which, to an impatient subscriber, could well cause him to repeat his sentence in the impression that the listener had not heard and so cause confusion with the reply. So it would appear that the lower orbit, non-stationary satellite may be the chosen intermediary in the long-distance telephone system of the future. But this does not discourage the supporter of cables as a means of communication. Rather, he is thinking of what more is possible at the next stage of development and is already planning for a bandwidth of 750 kc/s in each direction over 2,000 miles, which might well open the way to a real-time television service.

DRAKE AND GORHAM'S 75 YEARS

ALTHOUGH jubilees are becoming common in the electrical industry, few can point with pride to 75 years of continuity as a family concern. It was in 1886 that Bernard M. Drake borrowed the first £500 to set up business as an electrical engineer and shortly after was joined by J. N. Gorham to found the well-known firm of Drake and Gorham. Both had had varied experience in the electrical industry and one of the first jobs of the new partnership was the installation of a steam generating plant at the Prudential Assurance Company's Holborn offices. In that first year also installations as far afield as St. Michael's Mount and Port Sunlight were carried out.

In those early years the firm built up a special reputation for the installation of lighting plants in large country houses: perhaps the most important of these was Chatsworth House. This received wide publicity at the time and contemporary accounts speak in glowing terms of the adaptation of chandeliers to receive the "glowing Swan burners." The installation also had the unusual feature of hydro generation using the high pressure water supply to the great fountain, a decorative feature of the house. From the first, the firm had achieved a sound reputation which is reflected in the list of installations they carried out. They range from Westminster Cathedral to Manchester Assize Court; from Windsor Castle to a Lancashire cotton mill. One important feature of Drake and Gorham work was their acceptance of responsibility for the periodic testing of the wiring and equipment.

In 1901 the firm became a limited company, with a capital of £125,000 and at the first meeting a profit of £12,081 was recorded. The following year they branched out into overseas contracting, with several orders in hand.

Right from the commencement the firm had made much of the electrical equipment for the installations they were undertaking. As a result the manufacture of electrical gear developed in parallel with the contracting business, and in the early 1900's exports of such equipment commenced. The company also operated a trade department which in 1919 became a separate subsidiary. Drake and Gorham (Wholesale) Ltd. This was eventually closed down in 1957 to concentrate the company's resources.

In the years between the wars the installations in country houses fell to only a minor role in the company's activities and the wiring of many notable buildings in the country was undertaken. The most important of these was undoubtedly the rebuilt Bank of England head office, since one of the requirements was an installation that would last for over a century. To this end conduit for heavy gauge copper was used, with Admiralty gunmetal outlet and switchboxes. This must have been one of the earliest uses of floor box systems, with provision for connections to all services at intervals of 2½ ft over all office floors.

After the second world war the time was one of reconstruction. The manufacturing activities were hived off to a new subsidiary, GM Engineering, and when the work was transferred to a new factory at Ottery St. Mary, the name was changed to Ottermill Switchgear Ltd in 1954. Three years earlier there had been a major reorganisation under which the original company became solely a holding company with Drake and Gorham (Contractors) Ltd formed to take its place alongside the other subsidiaries. Thus has the firm, over the span of 75 years, developed from the individualistic approach of the Victorian private proprietor to the complex organisation of a modern business.

Block-heaters for houses

TRIAL INSTALLATION PLEASES TENANTS

COMMERCIAL models of thermal-storage block-heaters can provide reasonable comfort conditions in local authority houses at a cost to tenants comparable with that of other forms of heating. This is the conclusion of the Electricity Council, set out in Utilisation Research Report No. 24. Requirements for this result are that the houses shall have rather better than average thermal insulation; and that a midday boost shall be applied in cold weather, followed by supplementary heating in late afternoon and evening.

The trials reported were carried out in 12 Leicester Corporation houses, arranged in terraced groups of eight and one of four. The houses had plan dimensions 17 ft 3 in. by 28 ft 8in., and have a hall, kitchen and living/dining-room on the ground floor and three bedrooms, w.c. and bathroom on the upper floor.

Heating Installation

On a basis of calculated heat losses, with allowance of 50% higher block-heater capacity, it was decided to place two 1½ kW heaters in each living-room and 1 kW heater in the kitchen and hall. From the beginning of the trials early in 1959 until the end of 1960, no charge was made for energy used in the block-heaters.

A 1½ kW coal-effect fire was provided in each living-room in addition to the block-heaters. A 2 kW immersion heater (supplied off-peak) in a well-lagged 40-gallon cylinder provided hot water, and an electric cooker was installed.

For control purposes, thermostats were installed, set at 60°F, 55°F and 50°F for living-room, kitchen and hall, respectively. Soon after the start of the test, the living-room thermostat was reset at 65°F, following complaints. A contactor in the block-heater supply for each house was controlled via a pilot wire from a Maclaren regulator mounted in a control kiosk, while the water-heater had a separate time-switch. Although the standard off-peak periods were 6 p.m. to 7 a.m. and 12.30 p.m. to 3.30 p.m., the master time-switch was set at 1.30 p.m. so as to reduce overlap with the separately controlled water-heaters, which were switched on for an hour at 12.30 p.m. The Maclaren regulator effectively switched on the block-heater supply at 10 p.m. for any external temperature below 30°F, with appropriate delays for higher temperatures. It gave a minimum one-hour midday boost for external temperatures below 60°F and a maximum of two hours when the temperature was below 30°F.

Test Results

Tenants were visited frequently during the tests. They were advised to keep windows normally closed and to rely on the ventilators provided for fresh air, shutting these overnight. They were warned that the system was not designed to provide full comfort heating in the evening on very cold days.

The results are presented in considerable detail in the report, and a wide variation between one house and another is apparent—traceable in part to the different occupancy patterns of tenants. This variation makes the average consumptions, shown in the table above, of debatable significance.

Table 1. Consumption in year ending 30 June, 1960—kWh

	Maximum	Minimum	Average
Block heaters	4,400	1,850	3,570
LR fire	3,180	30	800
Total, heating	6,580	2,170	4,370
Water-heater	3,490	780	2,550
Socket-outlets	1,440	240	620
Cooking, etc.	3,240	1,320	2,260
Total	12,580	5,700	9,800

Having regard to the variations, the report concludes that, correctly interpreted, the results show that at an annual off-peak consumption for space heating of less than 4,500 kWh, and a "topping-up" consumption of up to 2,000 kWh, it should be possible to maintain a minimum temperature of 60°F in the living-room, with topping-up to at least 65°F in the late afternoon and evening of working days and for longer periods at week-ends. At the same time, hall temperatures can be kept at 55°F and 50°F, respectively. The figure of 4,500 kWh attracts the comment in the report that it is "remarkably low."

The hot water consumption is thought to have been inflated by weaknesses in the design of the model used, a weakness which has now been corrected.

Demand Characteristics

Connections of the houses to the mains were arranged so that after diversity demand could be determined for the different types of equipment installed. Immediately after the water-heaters were switched on at 6 p.m., an ADD of 1½ kW was imposed. Although block-storage heaters could be switched on at 10 p.m., the ADD at midnight barely exceeded 2 kW, except on one day—showing that the heaters were being kept off-circuit by the room thermostats. Even at 4 a.m. the ADD did not much exceed

Table 2. Demand characteristics for a cold working day (12 houses)

		Living-room Fires	Socket-outlets	Cooking etc.	Total excl. Off-peak Load	Total incl. Off-peak Load
1. Average annual consumption	kWh	800	620	2,260	3,680	9,800
2. After-diversity demand						
8.00-8.30 a.m.* ...	kW	0·19	0·07	0·24	0·50	
8.30-9.00 a.m.* ...	kW	0·18	0·10	0·15	0·43	
4.30-5.00 p.m.* ...	kW	0·15	0·02	0·60	0·77	
5.00-5.30 p.m.* ...	kW	0·18	0·07	0·92	1·17	
Maximum	kW	0·61	0·24	1·05	1·45	4·50
3. Effective Load Factor						
8.00-8.30 a.m. ...	%	48	100	110	85	224
8.30-9.00 a.m. ...	%	51	70	170	100	260
4.30-5.00 p.m. ...	%	61	35	42	55	145
5.00-5.30 p.m. ...	%	51	100	28	36	95
On ADMD	%	15	30	24	29	25

3 kW, making it unlikely that kitchen and hall heaters received much charge. During the midday boost, ADMD hardly rose above 4½ kW.

The living-room fire imposed an ADMD of about 0·6 kW/consumer at about 9 p.m. Table 2 (previous page) expands these figures and adds estimates for load factors.

Conclusions

The cost of the full electricity supply has been estimated on a tariff with a primary block equivalent to £6 a year and a kWh rate of 1·2d/kWh; and off-peak supply charged at rates of 0·9d/kWh and 0·8d/kWh with and without midday boost. The total cost works out at £57, or under 23s/week, which is considered quite competitive.

On the whole, tenants liked the block-storage heaters, and all 12 tenants said they were satisfied with the heating provided in the living-room. Some supplementary heating was called for in the kitchen for meals and sitting (the system was not designed with this use in mind), but all found it warm enough for working in. All but one of the tenants said they would like to keep the heating installation.

Attempts were made to compare controllable (by dampers) and non-controllable block-storage heaters through the tests, but this did not prove possible. The report comments, however, on the high midday demands resulting from the midday boost necessary with the types of heater used. The magnitude of this suggests that for large-scale development of domestic block-storage heating, adoption of forced convection controllable-output techniques are likely to be necessary, so that full daily heat requirements can be stored during the night only.

Co-ordinating Research

PROBLEMS of co-ordination of research are such that there is a case for convening a national conference to take stock of the position. That opinion is advanced by the president of the Institution of Mechanical Engineers, Sir Kenneth Hague, in his presidential address delivered last week. Sir Kenneth is chairman of Babcock and Wilcox Ltd.

Company Research

The address is devoted to the general topic of co-ordination of engineering research, and the analysis it offers starts at company level. Here an important need is to look to the administration of any research department set up. The research manager should have the sympathetic help of a small committee composed of chief executives of the company, able to give advice about the type of work to be carried out. Further, the research manager himself needs to have sufficient personal ability to take part in the activities of research associations and other scientific bodies with which the company is connected.

There is a danger of including in research programmes items that entail the type of work that certain of the staff would like to carry out. That is the wrong criterion. Where a company is part of a group, priorities can be allocated to particular items, and those most important shared.

However much research co-operation is accepted, there will always be some work carried on secretly. This is the more so, Sir Kenneth thinks, because the days when a new idea could be patented with the comfortable feeling that the work would be protected for a time are largely over. It is often preferable to develop a new idea and put it into practice without a prior patent application "which enables competitors and even customers to apply all their efforts to circumvent the patent instead of working on their own original ideas."

Even if a patent is obtained, its advantages may be so uncertain that they will not justify the trouble and expense of legal action if there is an infringement. Although this does not apply in every section of engineering, the problem of adequate patent protection is becoming increasingly difficult to solve.

Research Associations

Only when companies realise that their ideas are not exclusive are they likely to enter the research association movement.

How to judge a research association's worth is not readily apparent. Sir Kenneth argues against the criterion of money spent or graduate man-days of research, which have been used. An important factor in securing success is the whole-hearted co-operation of member companies, not just through subscriptions, but through general enthusiasm and sustained personal contact.

The director of a research association is likely to have more demands made of him than the director of a company establishment. In particular, he is likely to need to take the initiative to a far greater extent in determining the general research policy.

Universities have an important part to play in industrial research, but the fact that much of the work is carried out by graduates seeking higher degrees means that there is likely to be lack of continuity in any long-term research project. More consultation between industry as a whole and educational institutions could improve the position as it is at present.

Nationalised Industries

Research by nationalised industries has increased considerably during recent years. This new activity has meant an extra demand for research staff. Sir Kenneth expresses the hope that the new activities of the nationalised industries will be operated to avoid as far as possible overlapping with facilities already available. The way to secure this may be for the nationalised industries to take the initiative in consulting with individual companies who are their suppliers, as well as with research associations, before finally deciding their research programmes. There might also be co-operation among the nationalised industries themselves.

It might be a happy solution in this respect if the national research establishments and the nationalised industries could undertake the long-term basic research, if necessary with the help and co-operation of the research associations and company research facilities. The roles might be reversed for shorter-term work.

In the ultimate, real collaboration in the research field can only be practised effectively among people of reasonably equal understanding of the subject under discussion. Without that condition being satisfied, time is wasted in communication. Real collaboration requires the establishment of an agreed minimum of routine communication and a sensible balance between action and discussion. Collaboration can result in a tremendous waste of time if it is overdone. That can result in the real aim, efficiency in co-ordination, being completely overlooked.

Rotating machine core steel

ADVANTAGES OF NON-DIRECTIONAL COLD ROLLED SHEET

by J. H. Walker, D.Sc., Ph.D., M.I.E.E., A.M.I.Mech.E.*

AN important step in the manufacture of magnetic sheet steel has been the development, during the last 20 years, of cold rolled sheet. This material has a bright surface and also a substantially lower variation from the nominal thickness than is the case with hot rolled sheet. These properties make it possible to build tight, uniform cores on medium and large rotating electrical machines. Until recent years, this cold rolled material could only be obtained in the low loss directional form, which is, of course, ideally suited for use in transformers. In machines, however, the directional properties cannot be fully utilised to reduce losses, so that the high cost of this material makes its use uneconomical in this application.

Cold *v.* Hot Rolled Sheet

To avoid these difficulties in machine design, AEI has, in the last few years, developed the application of a cold rolled *non-directional* sheet steel which has become available in the U.K. It has electrical characteristics more or less equivalent to those of hot rolled material but with the surface finish and thickness variation of the cold rolled directional sheet. Moreover, it compares favourably in cost. The first cold rolled steel of this type corresponded in specific loss to normal hot rolled dynamo grades, but more recently a grade corresponding to hot rolled transformer sheet has become available.

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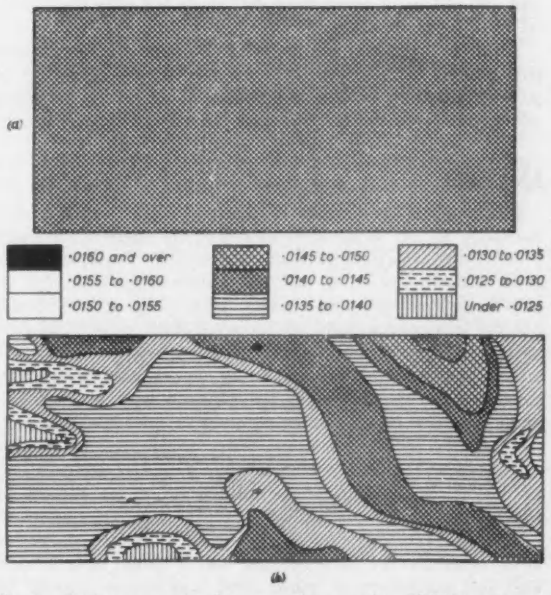

Fig. 1. Thickness variation for two random samples of 0·014 in. nominal transformer grade sheet with the same specific W/lb loss: (a) cold reduced, 32¾ in. by 15 in., (b) hot rolled, 36½ in. by 15 in. Rolling direction for both sheets: vertically down the page

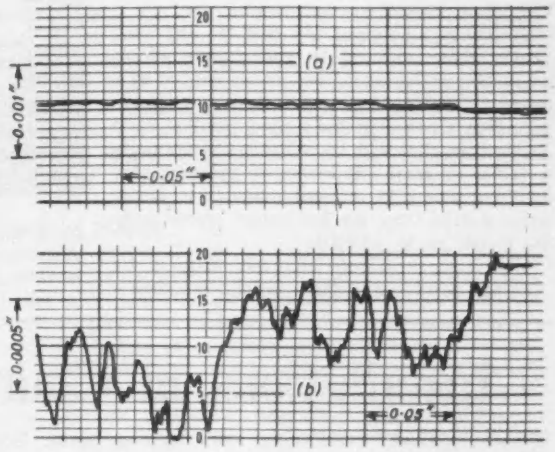

Fig. 2. Talysurf recordings of surface finish on the samples of Fig. 1 taken over a random length of ¼ in. Note difference in vertical scales

In Figs. 1 and 3 the variation in thickness over a sheet of this cold rolled material is compared to that of an equivalent grade of hot rolled material. These contour maps show in a striking manner the reduction in thickness variation obtained by cold rolling. In these two particular samples, selected at random, the variation on the cold reduced steel is 0·001 in., and on the hot rolled 0·0035 in., each on a nominal thickness of 0·020 in. The corresponding values for the cold and hot rolled high-grade material with a nominal thickness of 0·014 in. are 0·0005 in. for cold rolled and 0·0035 in. for hot rolled.

Surface Finish

The improvement in surface finish is shown by the Talysurf recordings taken on the same sample sheets and shown in Fig. 2. Each trace represents a length of about ¼ in. taken at random on a sheet. On the cold rolled dynamo grade material the average surface variation was 24 micro-inches, whilst the corresponding value for the hot rolled was more than five times greater; that is, 128 micro-inches. Again, the surface variation on the high-grade material was 5 micro-inches on the cold rolled and more than 20 times greater, or 106 micro-inches, on the hot rolled. These laboratory figures, showing the great superiority of the cold reduced steel over the hot rolled from the points of view of thickness variation and surface finish, have been fully confirmed by experience obtained by AEI in actual machines.

The dynamo grade cold rolled sheet has been used by AEI for some years for a wide variety of electrical machines up to and including large water-turbine-driven generators. This material was completely successful, as

shown by the tight cores obtained having a high stacking factor and freedom from waviness.

The recently developed transformer cold rolled sheet has also been applied to the manufacture of a number of machines, including a turbo-generator rated at 70 MVA, again with complete success. With this experience in the application of the material, AEI will use the high-grade cold rolled sheet for the two 111/120 MVA, 500 r.p.m. generator/motors now building to the order of the North of Scotland Hydro-Electric Board for the Cruachan pumped-storage station.

It may be mentioned here that the improved space factor obtained by cold rolling allows about 5% more laminations to be stacked in a given core length, thus permitting a corresponding increase in the output from a given frame size. Although ductility is not normally a factor of great importance in machine core building, the cold reduced material is rather more ductile than the hot rolled, particularly the higher grade material.

Experience obtained with this material by AEI has been so uniformly satisfactory that it is now used as standard in many lines of machines, from small industrial motors to large hydro-generators.

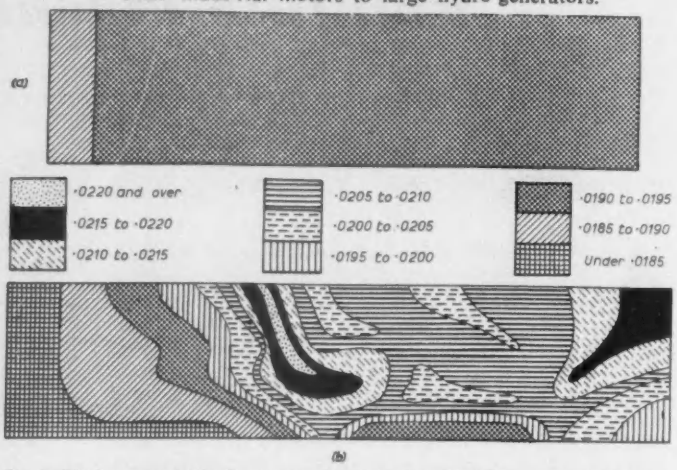

Fig. 3. Thickness variation for two random samples of 0·02 in. nominal thickness dynamo grade sheet with the same specific W/lb loss: (a) cold reduced sheet, 39¾ in. by 10 in., (b) hot rolled sheet, 44¾ in. by 10 in. Rolling direction for both sheets: vertically down the page

Installations in Churches

ELECTRICAL installations and lighting plans for Church of England churches are the subject of recommendations in a revised publication of "The Lighting and Wiring of Churches" published last week. So far as lighting is concerned, IES Code levels are adopted, and the recommendations give considerable attention to the direction of lighting and to fittings. They carry a warning that few electrical contractors have much knowledge of the "art of lighting," although their advice may be invaluable over questions of installation cost and maintenance.

For wiring installations, the basic requirement is compliance with the IEE Regulations. However, on details the requirements in some cases extend further.

Acceptable Systems

Three systems of wiring are acceptable: m.i.c.c., p.v.c-insulated cables in steel conduit or trunking and p.v.c-insulated and sheathed cables in certain restricted circumstances. Where m.i.c.c. is used, it is a requirement that all operatives shall have received an approved course of instruction on the use of the system. Accessories have either to be those of the cablemaker or approved by him. Insulation between conductor and cable sheath has to give an infinity reading on a 500 V test. Where m.i.c.c. is run in contact with stonework or materials such as new oak liable to give rise to corrosion, it has to be provided with p.v.c. serving.

Only p.v.c.-insulated cables are accepted for use in conduit or trunking and a conductor minimum of 3/·029 in. is fixed. Conduit has to be heavy gauge, screwed welded steel, either black enamel finish or galvanised. No inspection- or solid-type bends, tees or elbows are permitted.

So far as p.v.c.-insulated and sheathed cables are concerned, these may be used only where the installation is "fully protected from mechanical or mischievous damage and is not liable to attack by rodents." There is a warning that although the system is generally thought to be cheaper than m.i.c.c. or cables in conduit, this is not necessarily the case in church buildings. Where these cables are used and there is any risk of dampness, junction boxes have to be filled with a weather-proof plastics compound or else have to be of an all-insulated pattern fitted with watertight gland entries.

Earthing

Earthing and the connections of lighting fittings received special attention in the notes. In particular, despite IEE Regulation 403, lighting fittings containing metal-work and any chains or other supports associated with them have to be efficiently earthed.

Another earthing requirement is that the contractor shall, where possible, arrange for the supply authority to provide earthing facilities. The use of e.l.c.b's is required where adequate earthing cannot be obtained otherwise.

Heating

Electrical space-heating equipment, like lighting, has normally to be connected with suitable high-temperature precautions. High-temperature sleeving is required to be used with m.i.c.c. and tails of butyl-rubber-insulated or silicone-rubber-insulated cables for other cases. Fixed heating appliances have to be controlled by double-pole switches.

All heating installations using appliances with non-luminous elements have to be provided with at least one neon warning light, connected to give an indication that the system is in operation. Any non-luminous heating appliance which may get hotter than a surface temperature of 140°F is required to be placed where it cannot be touched or else protected by a grill or suitable guard.

The full requirements of the publication are suggested as a condition of contract for any church installations, and the suggestion is made that contractors should be required to give a written undertaking to comply with them. It is further laid down that only NIC-enrolled contractors should be used in church installation work.

E.deF. – C.E.G.B. supply philosophy

SOME COMPARISONS OF THE TWO SYSTEMS

DIFFERENCES in the philosophy and practice of electricity generation and transmission between France and Great Britain were expounded to a large audience at the Institution of Electrical Engineers last Thursday by Monsieur P. M. J. Ailleret, deputy director-general of Electricité de France, who is also the overseas representative in France of the IEE Council.

Although electrification in the two countries had followed similar lines, there were significant differences attributable in part to geographical and political features of the two countries. Because of differing technical developments, direct comparison of methods was, he said, not easy. The consumption curves for the two countries over the years were roughly parallel with the rate of annual growth, about 7% for both countries. At present, France's total consumption was about that of Great Britain in 1955, and France would attain this country's present consumption by about 1967. Steam generation formed the basic method in both countries and size of sets was growing with advance in techniques. Possibly, development in France had been more systematic, for the move to 125 MW sets was made much earlier than here and, in the future, these would be used only in special cases, since 250 MW sets were now standard.

Hydro Decline

For many years, French electricity growth had been based on roughly equal development of steam and hydro plant.

Until about 1955, roughly half of electricity generation had been by hydro power. It had now been decided that new hydro plants would be limited to outputs of about 1·8 by 10^9 kWh p.a. In consequence, by 1976 the proportion of generation by water power would be only about one-third of the total. Hydro resources were estimated at 80 by 10^9 kWh p.a., or about twice the present production, and, with developments in tunnelling and earth-moving equipment, economical use of sites previously too expensive to exploit would be practicable.

Comparing the British and French grid systems (see ELECTRICAL TIMES, 15 June, 1961, p. 943), M Ailleret emphasised the importance of the hydro-electric generating stations, which required a system capable of transmitting bulk power over long distances. Most of the grid was operating on 220 kV and use of 150 kV, although still very important, was declining. For the past ten years, 220 kV systems had also been designed for easy conversion to 380 kV. For example, a tower design used was suitable for carrying double-circuit, single-conductor 220 kV lines which could be brought together to form single-circuit, two-conductor bundles for operating at 380 kV. This could be done without extensive restringing and at a cost only 5% above that of the original 220 kV line.

A new tower design had also been evolved which required slightly less steel than former designs and was rather better in appearance. Because of the bulk power transmission need, the French network had greater capacity than the British, even though the peak load was hardly more than half the CEGB peak load.

M Ailleret referred briefly to the possible use of gas-turbines for peak-load supply and to the Rance tidal scheme which, it is hoped, will provide about 10^9 kWh p.a. This plant will have twenty-four 10 MW reversible pump turbines of the bulb type.

Nuclear Policy

Turning to the future of nuclear generation, he said that the reactors developed in both countries were basically similar although, because until recently France did not have enriched fuel, operation of the French reactors would be dependent on natural uranium. France, he said, had been accustomed for a long time to importing primary energy and in consequence was not developing nuclear power stations as a major part of the base-load generation plant but rather to keep up with, and explore, developments in reactor construction and design.

In Great Britain, on the other hand, when the shortage of indigenous fuel became apparent, it was strongly felt, and a considerable programme of nuclear construction was undertaken.

France's three power generating reactors were all at Chinon, about 30 miles from Tours. EdeF 1 was scheduled for operation in 1962. The station had an outdoor turbo-generator and this had been tested. The net electrical power of EdeF 1 would be 68 MW. Great difficulties had been experienced in welding the pressure vessel, and cracks that appeared in the early stages had necessitated complete dismantling. It had now been reassembled and pressure-tested successfully. EdeF 2 was progressing and would have a net electrical output of 200 MW. Work had also started on EdeF 3. This design was notable for its size; the planned electrical output was 375 MW rising later, it was hoped, to 550 MW, and notable also for the use of a pre-stressed concrete pressure vessel.

Referring to power interchange with other countries, M Ailleret said that although this exchange was common to most European countries it formed a relatively small part of each country's needs. Thus the French imported about 2% of their requirements and exported the same amount, so that on balance exports and imports only amounted to about ±1%. Differences in the times of peak load were more pronounced between France and Great Britain than with her continental neighbours, and only experience with the cross-Channel link would show whether a stronger link would be justified at a later date.

Discussion

In the discussion following the lecture, Mr T. RICH asked how electricity generation had been affected by the discovery of natural gas and liquid fuel. M Ailleret replied that, although only 6% of France's primary fuel requirement, natural gas was very important because of the need to import primary sources of energy. The decision was

taken after its discovery to utilise the gas as quickly as possible and, since electricity generation was a convenient use, a high proportion of the stations in the southern part of France had been operated on natural gas. However, it could be used more efficiently in industry and, as plant suitable for its use was installed, it was being withdrawn from electricity generating stations. Its use to the supply industry was therefore only temporary and after next year only one generating station would still be operating with natural gas. Indigenous liquid fuel was of little importance.

Asked about earth wire policy on transmission lines by Mr G. R. F. NUTTALL, M Ailleret said that, although towers were designed to take earth wires, they were not fitted unless the isokeraunic level was high. They were used for distances of one or two miles from substations to protect transformers but, at greater distances, effective protection was afforded by corona. EdeF used high-speed, three-phase reclosers and, on some lines, low-speed (0·8 sec), single-phase reclosers, and these had proved effective for clearing lightning faults.

Mr H. W. HUDDART wanted to know of French experience with outdoor generators and how they viewed the British policy of putting some switchgear indoors. In reply, M Ailleret said that only in the south of France, where the climate was suitable, was outdoor generating plant installed. Chinon had outdoor units although it was in central France, but this was not general practice. EdeF had never thought of putting circuit-breakers and transformers indoors, he said (presumably because pollution problems were not so severe as in this country—Ed.).

Referring to one of the slides illustrating transmission towers, Mr. V. G. HAYDEN asked if it was usual to run two 380 kV single circuit lines side by side rather than using double-circuit towers. M Ailleret said it was. In open country, double-circuit lines were never used. Two lines of towers were preferred. These increased cost by about 5% but they were less likely to be faulted simultaneously, and experience had shown them to give better service. Double-circuits were used in densely populated areas, but EdeF did not have to face such strong objections to lines as that presented to the CEGB. Mr W. H. DUNKLEY commented that in Britain about 60 months was allowed from the initial steps in planning a line, including obtaining wayleaves, to its commissioning. In France, M Ailleret replied, it took about 18 months and rarely more than two years.

Details of French experience with conductor vibration and galloping was sought by Messrs V. O. BOYCE and C. E. RIDPATH, and Mr S. S. SNOW wanted to know whether experience with concrete towers had been satisfactory. In reply, M Ailleret said that EdeF used a damper similar to the Stockbridge type but that these were not installed when the line was erected. Practice was to observe behaviour of the line and only to fit dampers if excessive vibration was noted. Vibration recorders used gave an approximate indication of the amplitude. Other types of damping had been investigated; for example, linking the conductors of double-circuit lines. No galloping conductors had been reported in France, a possible reason being the higher stringing tensions used and the experience with long spans.

Although many types of concrete towers had been tested, none had proved cheaper than steel for extra-high voltage use. However, at 15 kV concrete and pre-stressed designs were much superior to wood from all points of view. France had few intermediate voltage circuits between 15 kV and 63 kV and, therefore, the voltage at which steel became more economical could not be stated with certainty.

In answer to Mr D. B. IRVING, M Ailleret agreed that system voltages tended to double every 20 years. Although in France the mean transmission distance would tend to decrease over the next ten or 20 years because of the move away from hydro generation, the capacity of the lines and, therefore, their voltage rating would need to increase. He hoped that, having missed the boat at 400 kV, a world-wide standard voltage in the 700 kV region would be agreed soon. He emphasised the importance of preliminary work on higher voltage systems. In France experimental work had begun on 400 kV during the war, and preliminary investigations of 700 kV systems were now being considered.

Referring to the equally shared Franco-Belgian nuclear station under construction in reply to a question by Mr D. H. THOMPSETT, he said contracts had recently been placed for the station, which would be in France close to the frontier with Belgium. The station would be of Westinghouse design with a pressurised water reactor rated 240 MW and manufacture would be split between the two countries.

A vote of thanks was proposed by Mr Brian Donkin.

Experimental Nuclear Reactors

COMPARED with workers in the field of conventional power generation, nuclear engineers have made little progress towards the design of a plant with low initial cost and high-operating efficiency, but which uses fuel in such a way that it adds little to the cost of the power generated. This was said by Mr H. W. Bowker, of the United Kingdom, when he addressed the International Symposium on Power Reactor Experiments, held last week in Vienna.

Opening the symposium, which was attended by nearly 200 nuclear experts, Prof Balligrand, IAEA director for technical operations, said that specialists needed to intensify their efforts to reduce building costs and increase the output of power reactors. Attempts were being made in two directions: on the one hand, to improve proved reactor designs, for example, reactors cooled and moderated by light or heavy water and organic substances; the alternative was to consider new concepts such as the high-temperature gas-cooled reactor, nuclear superheat reactors and steam-cooled reactors.

Research, development and engineering aspects of the Dragon reactor at Winfrith Heath were described in two papers. Dragon would help in the investigation of problems involved in the development of high-temperature reactors for power or propulsion purposes. The Dragon type of reactor was potentially worth developing according to Mr G. E. Lockett (ENEA), for it gave a high output per unit core volume, a high gas outlet temperature and a high heat output per unit of fuel used.

In the USA, an experimental beryllium oxide reactor (EBOR) is soon to be constructed. This reactor will be used to test fuel elements and moderator designs suitable for gas-cooled reactors intended for electric power generation or for use at sea. The reactor will use helium as coolant and beryllium oxide as moderator. Dr Shastrom, in describing the reactor, said it would be a serious contender in the race for economic nuclear power in the 20 MW to 100 MW range, especially if the reactors were coupled to closed-cycle gas-turbines.

A wider international interchange of information on reactor safety was urged by Dr F. Thompson (USA). He also emphasised the need for thorough training of reactor operators from the developing countries. Competitive nuclear power was not far distant in the USA, he said, and there was an urgent need to train reactor staff.

NOTES ON WIRING

BY MEGOHM

SEVENTY-FIVE years is quite a long time, and when an electrical contracting firm can claim that length of existence there is every excuse for a party. I went along to such a party recently and, apart from meeting some old friends, I spent some time examining exhibits of early days of the firm. Catalogues of that age tend to make us smile, but I was more amused to read through the pages of the "Wages Book." Times certainly have changed! So have the instruments used for testing installations. The very early electricians must have been looked upon with suspicion when they produced these weird-looking brass objects and started connecting up wires to them.

Anyhow, this firm must feel very proud of their efforts and I would just like to add my good wishes to the "old firm!" And I mean that in more ways than one.

Modern Installations

My remarks on the possible troubles if certain modern flats and houses have to be rewired have raised the old argument of "conduit system *v.* m.i.c.c. system." This difference of opinion seems to have come round as regularly as Bank Holidays, and we never really seem to get a perfect answer. I wonder if, in many cases where m.i.c.c. installations are said to cost more than conduit installations, it is the labour which makes the difference? Of course, one of the major troubles on m.i.c.c cable installations is damage by "other trades." These operatives are not, apparently, concerned with anyone else's materials or problems. It is quite common to find, for instance, a tile-layer cheerfully hacking away the wall with a chisel at floor level—just where the m.i.c.c. cable has been installed and considered to be in a "safe" position. Other problems arise where partitions are erected after the building is completed and long spikes are driven into the screed and through the cables. Conduit, too, can suffer in this way. Such happenings cause a lot of trouble and even the best-planned job may suffer in this way.

I suppose this argument will go on for some years to come and, in my opinion, a *general* statement regarding the relative costs of the two systems cannot be made. Each installation must be investigated individually before the particular system is put forward to the client.

Electrical Risks

I note that I have been accused of "preaching to the converted" over electrical risks. I realise that if I preach on this subject in these columns I perhaps can rightly be accused of such things. But am I, in fact, "preaching?" Am I not merely reminding the converted to keep these things in mind and to do something about them? I know from experience that these "prods" do some good. The reader who wrote about my preaching is probably quite right about the non-technical Press being difficult about this matter. Likewise, they do not report electrical accidents in a way that would serve as a warning. This may, of course, stem from lack of information at the source of the matter—the inquest.

However, I have noted a tendency for certain newspapers to take more interest in electrical matters generally. One instance I call to mind is the investigation of the door-to-door selling of "electric central heating systems." I might add that this was a Sunday paper, and those papers printed for that day seem to be in less of a hurry than the dailies when it comes to giving facts.

I feel that I must continue to preach and hope that my comments do not fall on stony ground.

Tightening Bushes

I had reason, quite recently, to examine the conduit work on a new building and was amazed at the damage done to the male bushes at some outlet boxes. I drew the site operative's attention to the matter and it turned out that ordinary grips had been used to tighten the bushes.

This, I might add, was not an isolated case and, although the sharp edges (caused by the use of grips) had been attended to, the bushes were badly mauled. It is really amazing how many operatives use the ordinary grips to do this job when there is a tool specially made to do the work more easily and better. Correct tightening of bushes is extremely important and this should be done correctly as "standard practice" by operatives.

Cable Covering

We in the electrical industry are used to new ideas coming on to the market, but I feel that a few eyebrows will be raised when engineers see the latest in "cable-covers." This comprises a flexible p.v.c. tape with interlocking beading along each edge, with a pull fastener which we all know as a "zip." The cover is dust- and moisture-proof and is extremely tough. The cover is available in sizes from $\frac{1}{8}$ in. up to 3 in. inside diameter, and in black or transparent p.v.c. It is claimed that this cover can replace conduits in certain circumstances, or can be used as a conduit cover, giving protection from corrosion.

The piece which I saw was not long enough to experiment with, but I could see quite a few uses for it. It may, of course, meet some opposition in the trade but, used intelligently, it could prove a boon. It is quite easy to trace a cable in the covering by merely unzipping the sheath. It could prove useful in certain temporary wiring situations where the cables are awaiting final drawing into metal conduits. I have seen sacking and paper wrapped around such "temporary" cables and when it was time to install them in a permanent manner they had to be renewed. I shall be very interested to see how this patent cover is received in the contracting industry.

Pipe Detector

I was very interested in another new product making its appearance on the market. This is a cable and pipe detector and is described as being "transistorised." I know that this is not exactly a new idea in the trade, but this particular set looks extremely neat and easy to handle. Perhaps the partition fixers mentioned earlier in these columns might be persuaded to buy a set and thus avoid damage. Seriously, I feel that contractors should make more use of this type of instrument, and every electrical clerk of works should have one on site—and, of course, be taught to use one. I, personally, could find use for one at times.

Personalities *in the industry*

Mr G. Singleton

Mr J. P. Evans

Mr A. Perry

Mr N. R. D. Gurney

Mr O. W. Humphreys

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B.SC.(TECH.), PH.D., A.R.C.S.T., A.R.I.C., who is relinquishing the post on medical advice but will continue as technical consultant and director until his retirement next year. Dr Brown was trained as a physicist at King's College, London, taking an honours degree under Sir Edward Appleton. After a short period as a flight lieutenant in the RAF he joined the Telecommunications Research Establishment in 1940, working at Rugby. Three years later he entered the BTH Research Organisation, working in the radar department. In 1950 he transferred to Metropolitan-Vickers as chief engineer of the Electronics Department, and was appointed chief electrical engineer at Trafford Park in 1959. While at Rugby Dr Brown began work on micro-waves, wave-guides and aerials. At Trafford Park his work has included the development of digital computers—in particular the AEI 1010, a 50 MW proton accelerator, and more recently he has been responsible for engineering matters at Manchester in connection with the Heavy Electrical (India) Ltd. project. Dr Whitworth has been technical director of AEI Lamp and Lighting Co. since 1957. He joined the BTH Rugby Lamp Works as a chemist in 1923, became technical assistant to the Lamp Works manager in 1938, was appointed head of the Lamp Engineering Department in 1950, and manager in 1956.

Previously a management accountant with Evershed and Vignoles Ltd., **Mr G. B. Jones** has joined Dynamo and Motor Repairs Ltd. as secretary and chief accountant.

Mr J. E. Bailey, B.A., GRAD.M.I.MECH.E., has been appointed assistant superintendent, Petershill Works, AEI Turbine-Generator Division. Educated at Adams Grammar School, Newport, Shropshire, and Trinity College, Cambridge, he joined Metropolitan-Vickers Electrical Co. in 1953. After completion of his college apprenticeship at Trafford Park he became cost reduction engineer at the Petershill Works. He returned to Trafford Park works in 1957 as production engineer, Small Turbine Dept., and was appointed divisional production engineer of the Turbine-Generator Division in 1958.

Mr H. Zeffert, A.F.R.AE.S., A.M.I.MECH.E., MEM.A.I.E.E., has been appointed chief systems engineer of the new Systems Division formed by Vickers-Armstrongs (Aircraft) Ltd. His deputy is **Mr M. H. Still.**

In new changes in the Osram Lamp Division of the General Electric Co., operative from 1 Nov., **Mr E. T. L. Wyton** has been appointed export sales manager, and **Mr J. S. Buck,** formerly sales manager for the Yorkshire area, succeeds him as area sales manager for the North West. **Mr W. Morgan** becomes area sales manager for Yorkshire in addition to the North East area, and **Mr R. W. Morgan** is now area sales manager for South Wales in addition to the South West area.

Dr J. V. Dunworth, C.B.E., has been appointed deputy director of the National Physical Laboratory, D.S.I.R., in succession to **Dr G. Macfarlane** who is shortly to take up the appointment of director of the Royal Radar Establishment, Malvern. Since 1959 Dr Dunworth has been deputy director of the Atomic Energy Establishment at Winfrith.

Formerly Eastern Counties representative to Allen West Ltd. for some years, **Mr E. Trattles** has joined Dewhurst and Partner Ltd. as western area sales manager.

OBITUARY

Mr W. Nutter, area sales manager of the Leeds depot of Chloride Batteries Ltd., died on 14 Oct., aged 59.

Mr F. Garside, A.M.I.E.E., A.M.B.I.M., sub-area commercial officer of No. 6 sub-area of the North Western Electricity Board since 1953, died on 25 Oct., aged 61 (*ESH, page 161). Before nationalisation of the industry in 1948 Mr Garside had been engineer and manager to the Kendal Corporation's undertaking for three years. From 1948 to 1953 he was section head (power sales) at the Board's No. 6 sub-area headquarters. He started his career in the industry with the Aldershot undertaking in 1918, but four years later joined Metropolitan-Vickers. After eight years with that concern he became chief technical assistant and distribution engineer in Upper Burma with the Burmah Oil Co. Returning to this country he joined the Basingstoke Corporation's undertaking as mains superintendent and in 1936 was appointed deputy borough electrical engineer and manager at Reigate.

Dr B. L. Goodlet, O.B.E., M.A., SC.D., M.I.MECH.E., M.I.E.E., who had been managing director of the Brush Electrical Engineering Co. since 1957, died on 27 Oct., aged 58. We reported on 3 Aug. that he was retiring from the executive post owing to ill health, but has since continued as vice-chairman. He joined Brush in 1956 as chief engineer and director. Prior to that he was with the Atomic Energy Research Establishment as deputy chief engineer, with responsibility for engineering research and development. In the early 1950's he was in charge of a design study for project "Pippa," which formed the basis of the Calder Hall plant. He gained early training and experience with Vickers Ltd. and Metropolitan-Vickers Electrical Co., with whom he was later technical assistant and research engineer. He went to South Africa in 1937 as professor of electrical engineering at the University of Cape Town. During the war he was for a time chief scientist at the Underwater Explosion Research Station, Rosyth.

NEW LITERATURE

Control of Nuclear Reactors and Power Plants

by M. A. Schultz

CONTROL of a nuclear reactor is a function complicated by time delays inherent in the nuclear fission process. In essence, the design of control systems is an exercise in servomechanisms, and it is from this standpoint that the present volume tackles the question. But it is no narrowly mathematical tome. Throughout the treatment of control techniques and measurements, a firm hold is kept on the realities of nuclear reactor design and operation; and for the engineer, this is helped by a pleasantly readable style. The early chapters are concerned with the elementary physics of nuclear reactors as they affect control, and with elementary servomechanisms. The reactor is then considered as an element in a control system chain, as a preliminary to the second half of the book, which goes further into practical control problems, including start-up, power operation and shut-down. Published by McGraw-Hill, 462 pages, 9 in. by 6 in. Second edition, price 97s.

Electrical Principles

by H. Cotton, M.B.E., D.SC.

THE first edition of this volume, intended mainly for grammar and technical schools, appeared in 1956 and has since passed through a further edition and a reprint. It was reviewed in these pages in November, 1956. This, the third, edition is little different from the earlier ones excepting that the chapters on a.c. have been somewhat extended. It remains a readable and quite satisfactory approach to the study of electricity, both theoretical and applied, for the elementary student. Published by the Cleaver-Hume Press, 423 pages, 7¼ in. by 4¾ in. 256 illustrations. Price 15s.

BOOKS RECEIVED

The Directory of Opportunities for Graduates, 1962. Brief accounts of companies employing graduates, indicating type of opportunity available. Published by Cornmarket Press Ltd., 368 pages, 8¼ in. by 5¼ in. Price 8s 6d.

UKAEA Reports. Maximum Permissible Doses from Inhaled and Ingested Radioactive Materials, No. E.1.2.3, 6d; Crystalline Fracture as a Criterion of Brittleness of Steels, by P. M. Donstov,, No. 107 (C); A Mass Spectrometer for Investigating Low Concentrations of Free Radicals in Gases, by P. G. Bentley, J. Bishop and J. Leece, No. TRG Report 66 (CA), 3s 6d. Obtainable from HM Stationery Office.

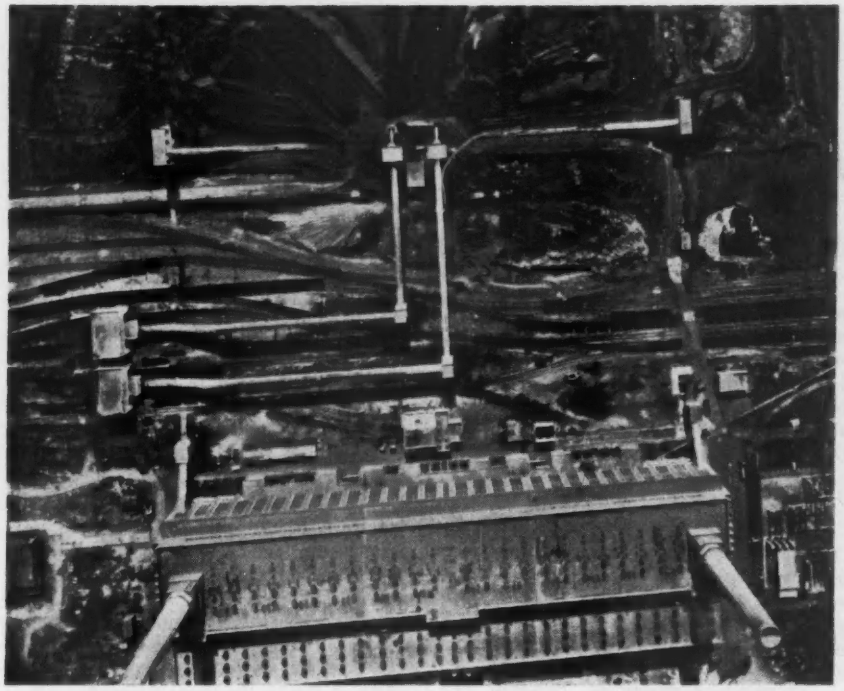


Fig. 1. Uskmouth power station, as it appears from a height of 1,100 ft. Only part of the coal stocking yard is shown here — all of it on the original photograph. A pair of photographs such as this led to a calculation that the station had 41,557 cu yd of coal in stock

Aerial Estimates of Coal Stocks

AERIAL photography is now being used to estimate fuel stocks at CEGB power stations. Hunting Surveys Ltd., who specialise in this work, have carried out many measurements, with a high degree of accuracy. The photograph reproduced is part of the fuel stockpile at Uskmouth "A" power station, near Newport, Monmouthshire. Taken from a height of 1,100 ft with a high precision survey camera of 6 in. focal length, it is part of one of a pair from which the stockpile was found to contain 41,557 cu yd of coal in March this year.

Volume Estimate

Special machines, such as the type illustrated in Fig. 2, permit precise measurements to be made by stereoscopic examination of overlapping pairs of photographs. The result is a plot of co-ordinated spot heights at relatively small intervals. The density of spot heights is far in excess of what would be economically possible by ground survey methods. With this information a computer calculates results rapidly.

The system is known as the Hi-spec. In addition to measurement of stockpile volumes, it has been used to check reservoir capacities. Special electronic computer programmes and plotting techniques on a photogrammetric instrument have been designed, which collate survey data and design criteria to produce earth work cut-and-fill estimates for road construction and site levelling and similar engineering purposes.

High Accuracy

Hunting Surveys quote the case of a reservoir capacity survey which produced a volumetric figure agreeing within 0·3% with the figure derived from gauge readings of the inflowing water when the reservoir was filled. In that case, a grid system of 1,450 spot heights was recorded from the air photographs, and the computer time for calculating the volume and the surface area was less than five minutes.

Stocks of coal and coke at gas works as well as power stations throughout the UK are being assessed by aerial photographic means. On one afternoon recently, six were photographed by Hunting Surveys. The technique is to form the basis of main annual stocktaking returns in the future.

Similar methods are used to produce large-scale site plans when needed. For example, plans have been provided for the CEGB on a 1/500 basis, with 1 ft contours.

Fig. 2. This type of photogrammetric machine uses stereoscopic examination of pairs of photographs to provide a series of spot heights from which coal volume can be calculated

Supply, ships and teaching

MORE I.E.E. LOCAL CENTRE ADDRESSES

EACH October, the chairmen of the local centres of the IEE deliver their inaugural addresses. The wealth of engineering experience they represent seldom fails to provide plentiful food for thought on the future development of electrical engineering. This year is no exception in this respect. This week, we summarise some of the addresses. Those to five other centres were dealt with last week.

Installations in Ships

Electrical engineering in the fitting out of ships is the subject chosen by Mr T. G. C. Harrop (J. I. Thornycroft) for his address to the Southern centre. He traced the development of size in ship electrical installations from the time, 25 years ago, when one electrical draughtsman and 20 electricians under a chief electrician were able to cope with the electrical work, to the present position. Today, as many as 175 electricians, 20 apprentices and 30 labourers may be involved on the electrical work of one ship. The time to carry out the electrical installation is often the determining factor of the completion date of a vessel. The cost of testing the electrical installation in a ship today is often higher than the whole cost of the installation some 25 years ago.

One result of the expansion of electrical services is that the number of cables to be carried in a ship has caused serious space problems. This is despite the fact that introduction of miniature cables for light current services has helped. The number of cables passing through bulkheads today is such that special glands have to be developed whereby as many as 80 cables are passed through one hole. A means has to be found to seal these holes and thus maintain water-tightness. Again, cables have to be bunched into hangers to save space instead of being neatly clipped to a perforated cable tray.

Apart from initial construction of ships, there is much electrical work by way of maintenance and repair to be provided for. Occasionally, sea-going ships are damaged and compartments flooded with salt water and oil. Usually, in such cases, all wiring is renewed. Sometimes motors and control gear respond to washing and subsequent baking and only require a thorough overhaul after this treatment. However, if the electrical gear has been exposed to the air for a long period after salvaging of a vessel, it is generally found necessary to rebuild and rewind everything.

Provision of repair services is often complicated because dockside space is not available in the right place when required. Extensive mobile generating equipment is required. The extreme of this in the case of Thornycroft's is a ship fully equipped as a power supply unit. She is diesel-electric propelled and the propulsion generators are used to supply power on 220 V d.c. up to a maximum of 600 kW; 415 V three-phase a.c. up to 375 kW is also available, and there are various d.c. and a.c. voltages for battery charging and other purposes. This ship is ideal for visiting vessels near a port when minor repairs are needed.

Mr Harrop refers at some length to the problems of demarcation in the shipbuilding industry, about which so much is heard. An example of what this means is given on this page. One of the problems of a shipbuilding and repairing organisation is that its work comes unevenly. Competition from manufacturing industry, however, makes it necessary to find regular employment for electrical staff. For this purpose, Thornycroft's have adopted the policy that any item required for the electrical installation of a ship which can be manufactured by the firm at a price competitive with that charged by normal firms should be so made. It is found that when a standard article is involved, the repair firm's price for making it works out at two or three times the manufacturer's. However, for one off requirements, an order can be completed more quickly and more cheaply.

What demarcation means . . . Take the case of a cable hanger which is mounted on the deckhead of a ship in way of insulation. We will start at the position where the bare steel deck is available. First of all, the electrician will have to specify the type of support he requires, and give full particulars to the light plater, who will manufacture the bracket which is attached to the deckhead. Next, the electrician will mark off the position of the brackets on the deckhead of the ship. When this is done a welder will be called upon and, while the light plater is holding the bracket in the position marked off by the electrician, the welder will weld the bracket. Next, the painter will have to give the usual undercoats and finishing coats of paint to the deckhead of the ship. Then the joiner will fit his insulation around the deckhead attachments as necessary. When the insulation is complete, the painters will then again come into operation and give the necessary coats of paint on the insulation. The light plater will follow up and fit the extension supports and then the electrician will fit the actual cable hangers and proceed to reeve the cables. If in the process it is found that an additional hole must be drilled in the cable hanger support, it will be necessary to call in a driller to carry out this operation after the electrician has marked off the hole and centre-popped it.

Grid System Planning

Changes in the planning of the grid system over the years provided Mr W. Painter (CEGB) with ample scope for his address to the North Midland centre. A necessary part of the full address is a history of the way the grid developed; but in this summary, more attention will be given to the comments on present trends.

A basis for planning development of the grid is given by annual area board estimates of the maximum demand expected on each point of supply from the grid, covering the ensuing seven years. The CEGB prepares an independent estimate for the country as a whole. These two estimates provide the basis for the six-year generating plant programme and that for the associated primary transmission network.

Supply points to area boards are of two types, according to whether bulk supply or local generation is involved. Area board estimates alone provide the basis for planning the capacity of bulk supply points. Where there is local generation, the firm output capacity is assessed as the maximum output capacity of the plant, with the largest generator out of service. Any difference between supply and demand on this basis is met by reinforcement. This may mean strengthening existing grid connections, or establishing a new supply point.

When considering whether a connection should be reinforced, attention needs to be given to merit order running of plant. With large modern power stations contributing high-merit plant to the national load, many of the sets in older stations are shut down in the national merit order much earlier than previously, and before the peak load at the station has correspondingly reduced. In many cases, all the plant at the station will be shut down before the local load has fallen below one half of peak. Thus there may be an import to the station off-peak which is greater than the grid connection capacity for peak load security.

This off-peak condition is examined as part of the annual survey. The cost of meeting the condition by reinforcement is compared with that of running plant in out-of-merit order. Reinforcement is embarked on only if the cost of the capital involved will be much less than the extra cost of running the local plant. However, with the advent of nuclear generation this problem is expected to become increasingly acute.

Substation Layout

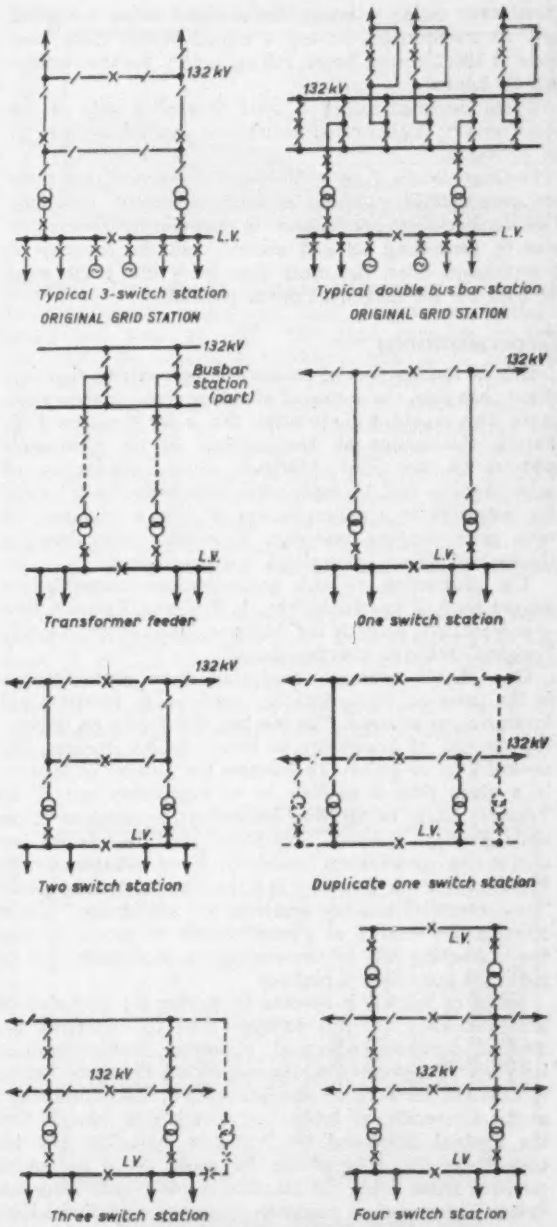
Substation layout has developed in recent years, with an eye on economising in switchgear. The evolution from the three-switch station is shown in the diagram. The first move away from three-switch stations was the radial transformer feeder from major generating stations. Then the move to additional 132 kV circuits made one- and two-switch stations possible, despite the lower assurance on continuity of each transmission circuit. Where line loadings make it desirable to share the normal load of a supply point between both circuits of a double-circuit line, the duplicate single switch station may be used.

As a supply point develops, the best use of switchgear may be obtained by a mesh station. Ultimate capacity of a bulk supply point is determined by the load which can economically be supplied over the associated distribution system. In no case is it necessary to provide for more than four transformers and four feeders, as shown in the last of the connection diagrams.

Most grid switching stations are unattended. In these cases, interruption of the transmission circuits is reduced to a minimum by providing motorised isolators, operated automatically from the protection equipment, and auto-reclosing equipment.

A special case that has developed is the direct connection of a large consumer to the grid. In some cases, the nature of the load is of more importance than its magnitude. This applies in particular to steel firms, where serious voltage flicker has to be faced. The interference with other consumers is less if the coupling is more remote. Thus, while the magnitude of load might permit connection to the 132 kV system, the desire to connect at a point of high fault level to reduce the voltage flicker effect may make connection to the 275 kV system desirable.

Switchgear for use on the grid has had to be designed for increasing fault capacities. Nearly all the original 1,500 MVA, 132 kV breakers have been replaced with



Development of grid switching stations from the original three-switch station. The four-transformer, four-feeder mesh station shown bottom right represents the ultimate requirements of a 132 kV bulk supply substation. All the preceding five layouts can form part of such an ultimate layout

2,500 MVA designs, with some of 3,500 MVA. On the 275 kV system, a new standard of 15,000 MVA has had to be adopted, after a start with 7,500 MVA.

Transformers for the grid are now based on agreed standard ratings, both in respect of size and reactance. On-load tap changing from +10% to −20%, in 18 steps, is adopted for all 132 kV transformers. A comparatively recent development has been adoption of a rule that the firm capacity of transformers at any bulk supply point is 30% greater than that given by the rating of the transformers. This is because the peak load is usually of short duration compared with the six-hour loading on which

transformer rating is based. The overload rating is applied only to transformers having a typical winter daily load cycle of 100% for six hours, falling to 60% for the remaining 18 hours.

If the overload rating is used, it applies only to the transformers; higher-rated switchgear and cables have to be provided.

Looking to the future, Mr Painter suggests that there are two factors requiring particularly careful watching. One is that a proper balance is maintained between the size of generating set and stations and the capacity of transmission lines, the other that every line route must be used for the maximum power possible.

Generalisations

One of the features of recent developments in electrical theory has been the increased attention given to generalisations. This provided the principle theme for Professor J. E. Parton (University of Nottingham) in his chairman's address to the East Midlands centre. Examples of generalisation that he deals with include Kirchhoff's rules for networks as a generalisation of Ohm's Law and, to take more modern examples, Rawcliffe's pole changing theory and Kron's generalised machine theory.

The production of such generalisations comes in the second level of human activity, in Professor Parton's view —immediately beneath the highest plane, which he calls "original, brilliant, creative ideas."

One of the spurs to producing more generalisations is the pressure on engineering teaching as research and inventiveness advance. The teacher, faced with an increasing amount of knowledge to impart to his students, has several lines of action. To increase the number of lectures in a given time is unlikely to be acceptable, nor is the Treasury likely to agree to increasing the duration of an undergraduate course. Something can be gained by eliminating obsolescent material from syllabuses, but Professor Parton does not like the idea of teaching only "fundamentals" and not touching on "application." There remains the seeking of generalisations of theory so that much teaching can be compressed—a professor's way of putting a quart into a pint pot.

Much of interest is devoted to tracing the evolution of generalisations. There is no space here to summarise the detailed arguments advanced. However, amongst particularly successful recent developments that Professor Parton mentions is the work on pole changing in induction motors at the University of Bristol. At first it was thought that the method developed by Professor Rawcliffe and his co-workers was only of use for speed ratios not much removed from unity; for example, an 8/10 pole induction motor. Later work is gradually removing such limitations, so that the stage has almost been reached at which pole changing between any two values is possible. One interesting outcome is that, contrary to original misgivings, noise, overheating and parasitic torques are all exceptionally low or negligible.

Another development much in the educational news of late has been Kron's work on generalised machines. From a discussion on it, Professor Parton goes on to describe a "newer and far more significant change" being introduced in America, pioneered by the staff at MIT. The idea is to meet the need of engineering students for more basic science than used to be taught. In a proposed four-year curriculum for MIT, engineers study subjects with titles such as "fields and materials." "electrical energy conversion" and "time modulation."

Commenting on such ideas, Professor Parton remarks that the immediate introduction of the students to generalised electrical machine theory is suspect. In a three-year university course, the better method might be to give one course in the second year along traditional lines, concentrating only on a few machines. This would then be followed in the final honours year with a course on generalised machine theory.

Engineer or Physicist

In recent years, the accent in education for an engineering degree has been placed on learning broad fundamental ideas. The extent to which university engineering should veer towards being applied physics provides Professor E. G. Cullwick (St. Andrews University) with a fruitful subject for his address to the Scottish centre.

Professor Cullwick agrees that the university is not the place where a student of electrical engineering should study industrial methods of production or learn to design a piece of equipment for such production. To produce a qualified electrical engineer within a university would require a lengthy course similar to those of the Russian monotechnics.

Taking this idea further, he points to the success in developing new techniques during the war by physicists who were drafted into engineering. He suspects that they were better equipped to turn their minds to new and unfamiliar problems; and that they included a larger proportion of men of the highest ability than the equivalent number of engineers, because "the battle for the academic respectability of science as distinct from technology, had already been won."

The traditional electrical engineering course seems well suited to the education of the majority of electrical engineers, but on the whole it fails to produce men as competent as the good physics graduate to tackle new and unfamiliar problems.

To improve matters, Professor Cullwick thinks that university departments of electrical engineering should take a more active interest in electrical science as a whole. A start should be made by a thorough revision of what are in English universities the first year courses. These could well be devoted to a continued study of classical physics from the A level standard, but with some emphasis on developments of fundamental theory of particular interest to the engineer. Basic applications of the physics could be studied, but they should be shown as arising naturally from the physics, rather than the physics being used to explain the working of the application. For example, the theory of the ferromagnetic circuit should be developed from the general laws of the magnetic field.

If a student can at this stage gain a real insight into the essential unity of electrical physics, he will be in a position to branch out into a particular specialised field with increased confidence and effectiveness. The increased emphasis on fundamental physics should be carried into the senior years.

Professor Cullwick does not maintain that the electrical engineer should be capable of doing all the work necessary in creative engineering. He does argue, however, that the essential functions of the electrical engineer and the physicist should not be confused. The engineer's true role is that of creator, whereas the role of the physicist is that of investigator.

Behind ideas of such developments lies a need to redress the present unbalance of status and esteem between science and applied science. The IEE could render a great service by determined effort to promote the publicity which is necessary to drive home a truer sense of values. Such an effort is necessary not because engineers should be status seekers, but because the welfare of the country demands it.

POWER SUPPLY

Statistics for September

SMALL increases in electricity sent out by the area boards, and in four cases a decrease on last year of up to 4½%, are recorded in the monthly returns for September. The national increase totals 0·8%, the lowest figure since February and far below the 18·6% for September last year.

The mainly industrial areas consumed 60% of the total sales and these increased by 1·4% on September last year, compared with 0·3% for the non-industrial areas. Industrial areas are defined as those where industrial consumers took more than 50% of the sales in the preceding financial year. At 6·1%, the corrected sales increase for the month, when weather conditions and number of working days are taken into account, remains less than half the corrected increase for September last year. The cumulative increase in units sold since April by the area boards is now 7·2%. In contrast, sales increases for the two Scottish boards remained fairly high during the month at 7·4% for the NSHEB and 8·9% for the SSEB. For the first nine months of the year, these two boards record sales increases of 10·3% for the NSHEB and 11·4% for the SSEB.

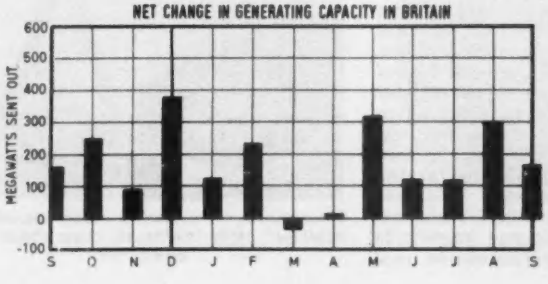
An unusual commissioning for the CEGB during September was the No. 4, 1 MW hydro-electric set at Cwm Rheidol. This set, by Harland Engineering is installed in the lowest station of this three-station scheme which will total 49 MW. The main function of this set, when the scheme is complete, will be to regulate the water flow from the lower reservoir into the river. The Kaplan turbine is designed to operate under a 30 ft head at 300 r.p.m. Also commissioned during the month was the fourteenth set at Uskmouth "B." This is a 120 MW English Electric set with an 860 klb/hr Babcock and Wilcox unit boiler. The SSEB commissioned a further 60 MW AEI turbo-alternator at Braehead station, bringing the total installed capacity at this station to 270 MW. The unit boiler built by Babcock and Wilcox is rated 550 klb/hr.

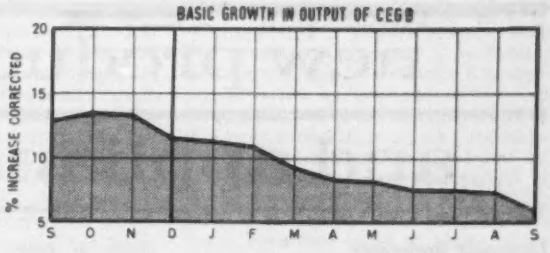
Fuel consumption, following the sales trend, fell compared with September last year. Coal consumption was down by 1·9% to 3,882 thousand tons and oil consumption fell by 6·1% to 365·1 thousand tons. There was a rise of 8·5% in the consumption of coke and breeze, but at 67 thousand tons this represents only a minor change in total fuel requirements..

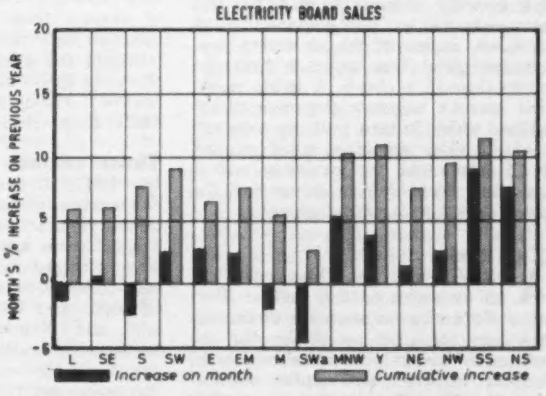
Electricity Board Sales Progress in September

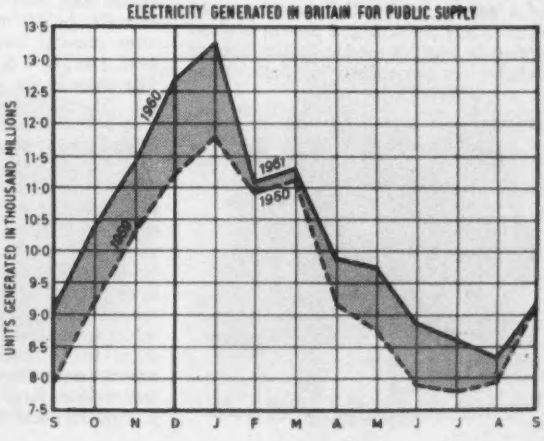
Board	Electricity sent out in millions of units	% Change Sept. 1960
London	602·0	−1·1
South Eastern	468·2	+0·5
Southern...	633·1	−2·4
South Western	308·9	+2·5
Eastern	769·3	+2·8
East Midlands	665·1	+2·3
Midlands	842·6	−1·8
South Wales	485·7	−4·5
Merseyside and N. Wales ...	540·2	+5·2
Yorkshire	890·5	+3·9
North Eastern	494·6	+1·3
North Western...	852·7	+2·6
Direct Supplies by CEGB	299·5	−3·3
CEGB Total	7,852·4	+0·8
South of Scotland	639·1	+8·9
North of Scotland	143·6	+7·4

Table excludes area board purchases from other sources









new products and appliances

Low-cost firelighter

CLAIMED to operate at very low cost is the "Matchless" firelighter from Best Products. It delivers a temperature of 800°C and uses a 1·1 kW heating element. The appliance has an induction motor and impeller fan to circulate air over the element and through a barrel to the base of the fire. The unit is mounted on a robust steel frame which enables the nozzle to be adjusted to varying heights. The body is constructed from pressed aluminium and the firelighter is controlled with a two position toggle switch marked "Fan only" and "Heater and fan." A pilot light illuminates in the "Heater and fan" position. It is finished in hammered bronze and designed for use with a 5 A socket. Price, which includes 6 ft of three-cored cable, is £5 19s 6d including purchase tax. *Best Products Ltd., Ranelagh Hse, Felixstowe.*

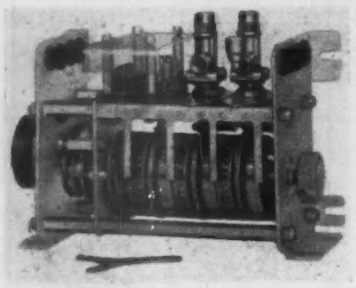
Cable winch

A NEW truck-mounted winch for drawing cables in to ducts has just been released by Gibbins and Co. A 19 b.h.p. engine of the air-cooled two-cylinder diesel type drives a hydraulic pump through a clutch. A treble reduction gearbox transmits the drive to the bollard which, in turn, pulls the rope and cable in. The maximum speed of pull is 25 ft/min and the maximum pull is one ton. *Richard C. Gibbins and Co. Ltd., Berkeley St, Birmingham 1.*

New timer

A NEW timer, the "Magnacam," is an extension to the Rodene Electrical Co.'s range of sequence timers and has been designed specifically for the automatic control of machine tools, laundry machines and similar applications requiring the simultaneous control of a number of functions which can be reset to any pre-arranged pattern at short notice as may be needed. It can operate switches or air-valves or both. Each switch or valve is controlled by two cams, one for the "on" and one for the "off" operation. Both valves and switches are of the interchangeable type, the valves being three-way units with ¼ in. bore suitable for pressures up to 80 lb/sq in. Switches are s.p.d.t. pattern rated at 15 A.

Up to 24 pairs of cams are accommodated in a single timer and the speed range is adjustable from 1 rev/7 sec to 1 rev/week. The driving motor or motors —two can be fitted for some applications —are of the self-starting synchronous type. *D. Robinson and Co. (Distributors), 5-7 Church Rd, Richmond, Surrey.*



One of the new range of "Magnacam" multi-purpose timers

Transistorised timers for welding

TWO new fully transistorised timers for use with spot-welding guns made by Portable Welders Ltd. are now in production. The first, Mark II, for use with S.15 and S.20 guns is designed to handle a 30 A line current; the Mark IV is for S.80 and S.120 guns and will handle a 100 A line current. The time cycle in both cases is determined by the discharge of current from a low loss storage capacitor into the base of a switching transistor and is variable from 2 cycles to 50 cycles. Prices are £28 10s and £60, respectively. *Portable Welders Ltd., Castle Mills, Buckingham.*

Thread restorer

A USEFUL device for the maintenance engineer is the Buckingham thread restorer, which will roll into its original shape screw threads which have been damaged through misuse or rusting. One tool can restore a full range of right- and left-handed metric, s.a.e. u.s.s. and Whitworth threads and can be used in confined spaces. Five sizes are available covering a range of diameters over the thread from ¼ in. to 12 in. and each size is supplied either in a 60° or 55° thread cone angle. The most popular size is 6203 for threads from ¼ in. to 1 in. with a swing of 3 in. The price is 90s. *G. E. Sim Engineering Co., Sheffield.*

Metal-sheet separator

A PROBLEM in sheet-metal factories is the separation of the top sheet of a stack of metal plates for handling, particularly when the sheets are covered with a protective film of oil, or rust inhibitor. By placing a magnetic unit on each side of the stack in close proximity to the plates, they will separate themselves by magnetic repulsion, so enabling them to be handled more easily and expeditiously. Special units for this duty incorporate large Alcomax magnets in a stainless steel case and can be used singly at the end of the stack or in pairs, one each side. They will function both with regularly shaped and irregular-shaped sheets. *Rapid Magnetic Ltd., Lombard St, Birmingham 12.*

Precision-forged locknuts

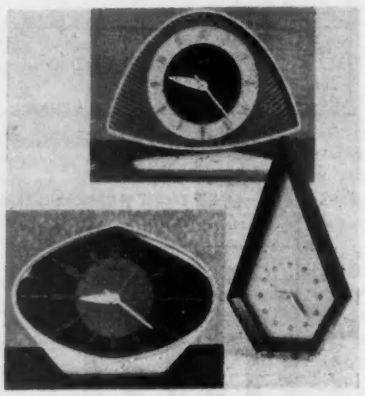
THE first precision-forged self-locking nuts in unified threads from ¼ in. to ½ in. dia are now in volume production in Britain. They cover the internationally known Nyloc range in both full and thin thicknesses. It is claimed that the precision forging process has resulted in positive savings to customers. *Simmonds Aerocessories Ltd., Treforest, Glamorgan.*

Wiring kit for handymen

CLAIMED to enable the average handyman to wire outbuildings safely and economically is a new kit announced this week. All components are said to conform to BS and a simple instruction booklet has been prepared in collaboration with electricity board staff. Manufacturers say that if the instructions are faithfully followed the installation will comply with safety specifications. Many of the more important connections in the kit are already made and factory tested. The kit contains two wall brackets, a lampholder, 18 ft power cable and a power socket. It sells at £6 9s 6d. *J. B. Potter Ltd., Lodge St, Leeds 1.*

Trio of clocks

THREE new electric clocks are in the Smiths range for 1961-2. Two of the models, "Calltime" and "Callrise" have alarm mechanisms. The latter is strikingly designed with bold dial in white, black and gold. Digits are illuminated with luminous spots. The "Calltime" is an oval shaped clock with a white moulded case. The dial is in black and gold and it measures 5¼ in. wide by 2¾ in. deep. More exclusively styled is the "Belvedere" with a walnut finish case. It is available with either Sectric or floating balance movement and cream dial with brass digits. Prices of these models are £2 5s 6d each for the two alarms and £8 7s 6d for the "Belvedere." *Smiths Clocks and Watches Ltd., Sectric Hse, Waterloo Rd, N.W.2.*



Three new Sectric clocks from Smiths. Above: "Callrise"; left, "Calltime"; right, "Belvedere"

Prices

FURTHER reductions in the prices of their epoxy resins have been announced by CIBA. The reductions have been made in most products in the "Araldite" range. Fuller details are available from the company.

Price of the "Prettyface" towel panel is £2 19s 6d and not £1 19s 6d as stated inadvertently in a recent issue.

Unusual fitting

AN unusual lighting fitting has just been announced by Courtney Pope. It is designed for wall mounting and is suitable for 60 W lamps. The fitting consists of a shaped wood-veneer backplate with a double curved-plastics diffuser and is 11 in. deep. The diffuser is simply hooked on to the main panel, permitting easy access to the lamps. Price is approximately £8 5s and delivery is ex-stock. *Courtney Pope (Electrical) Ltd., Amhurst Park Wks, Amhurst Park, N.15.*

Low leakage silicon rectifier

SUITABLE for magnetic amplifier applications is a new range of "top hat" diffused junction rectifiers with low reverse leakage. The rectifiers are suitable for 1·8 A forward current with a low forward drop of only 1·1 V and, at rated peak inverse voltage, the reverse current is only 500 microA at 150°C. The rectifiers are suitable for an operating temperature range −65° to 175°C and surges of 40 A for 0·01 sec. Bulletin SR-2012 describes these rectifiers, which are designated X10B1-6. *International Rectifier Co. (GB) Ltd., Hurst Green, Oxted, Surrey.*

Dust-proof transformers

DUST protecting enclosures are now available for Philips variable transformers for all ratings except the 20 A version. The transformer can be operated with the cover in position and provision can also be made for isolating it when the cover is removed. *Research and Control Instruments Ltd., Instrument Hse, 207 King's Cross Rd, W.C.1.*

The new Carron "Charmer" cooker to which we referred in an edition of the "Electrical Times" earlier this year

All-ceramic r.f. triode

AN important development in the field of r.f. heating is the introduction of an all-ceramic power triode said to permit operation at frequencies much higher than those possible with glass envelope valves of similar types. The valve can operate at full rated voltage up to frequencies of 100 Mc/s, whereas the glass envelope valves require reduced anode voltage at frequencies above 50 Mc/s. The first type available is designated 3RC/223E and is a near equivalent of valves 3J-Q-R-Z/222E which operate from a 6 kV supply and develop up to 24 kW output power. The new valve is available in forced air-, vapour- and water-cooled versions, has improved cathode design with greater reserve of emission than other types and also has a shorter coaxial stem for easier cavity mounting. *Standard Telephones and Cables Ltd., Connaught Hse, Aldwych, W.C.2.*

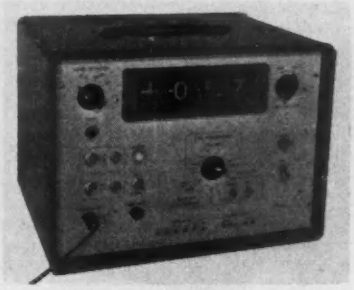
Non-reversible plug and socket

OF interest to radio and electronic engineers is a non-reversible plug and socket announced by Geo. Turnock. There is both a surface- and flush-mounted socket and the latter fits a standard 2 in. BESA box. Because it is non-reversible, the makers claim that it is impossible to put an ordinary live two-pin plug into the socket. *Geo. Turnock Ltd., Tunion Wks, Navigation St, Walsall, Staffs.*

Digital voltmeter

A VERSATILE instrument for measuring volts, frequency, time intervals and which also provides crystal controlled pulses is the Type M.1155 Digital Voltmeter-counter designed by Southern Instruments Ltd. The display is on conventional type in-line indicators and incorporates a latching system released momentarily at the end of each count to provide a continuous display uninterrupted by the counting period.

As a voltmeter the range is from 1 mV to 500 V; as a frequency meter, from 0·1 c/s to 120 kc/s, and as an interval timer, from 1 microsec to 27·7 hr. The input impedance is of the highest order and the instrument, which is mains powered, is compact, portable and robust. It will be available by the end of the year. *Southern Instruments Ltd., Frimley Rd, Camberley, Surrey.*



A compact electronic meter for measuring volts, frequency and time intervals. It incorporates a crystal controlled pulsing system

Economic fluorescent unit

DESIGNED to combine economy with attractive appearance is a fluorescent lighting unit from Wardle Engineering. It is 13¾ in. long and suitable for BS box and wall or ceiling mounting. The body is die-cast in silicon aluminium and is sealed against damp and dust by a sponge-rubber gasket. Illumination is provided by either one or two 8 W 12 in. MCF/U fluorescent tubes with the two lamps connected either in series or in parallel. Gear chassis and reflector are stove enamelled in white and plastic bi-pin lampholders have moulded leads. Switch-start control gear suitable for standard a.c. voltage is fitted, but gear for other voltages is available if required. *Wardle Engineering Co. Ltd., Old Trafford, Manchester 16.*

Blanket offer

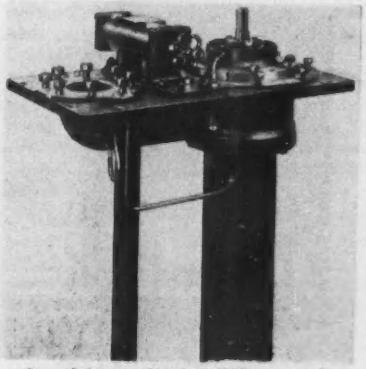
IN order to boost autumn sales of their electric blankets, Monogram are making an offer to retailers. Each retailer who orders 12 or more Monogram automatic electric blankets will receive free one GU1 electric underblanket. Closing date for this offer is 30 Nov. *Monogram Electric Ltd., Gatwick Rd, Crawley.*

H.R.C. fuse-links

A RANGE of fuse-links designed to BS 88:1952, category 440 AC5, has now been successfully tested for d.c. duty to 460 DC4. It is the Aeroflex-Brilag range and is available in 30 A, 60 A, 100 A, 200 A, 300 A and 400 A ratings at up to 440 V d.c. It is intended to expand the range still further. *Parmiter, Hope and Sugden, Longsight, Manchester.*

Tank-mounting pumps

LOW priced, self-contained pump assemblies in the IMO pump ranges, to be known as the KEB range, and designed for installation within the body of a tank with motor and by-pass valve externally mounted, are now available with outputs from 74 g.p.m. to 1,320 g.p.m. Because of their situation close to the suction point, the pump load is less and there is smaller chance of sucking air. The new range is particularly suitable for forced lubrication duties in turbine or diesel engine installations. *Mirrlees (Engineers) Ltd., Earl Haig Rd, Hillington, Glasgow.*



One of the new Mirrlees IMO pump units

An ammeter from the new Pullin Series 125 range

Hermetically sealed meters

A NEW range of hermetically sealed platform scale instruments has just been introduced which can easily be read from a distance of 18 in., even though the overall diameter is only just over 1¼ in. To be known as the Series 125, they have received full type approval from SRDE and the scale presentation incorporates graduations and figures in line with the new draft, BS.AB(INE) 1661. They are physically and electrically equivalent to the 1¼ in. hermetically sealed instruments to DEF 62 when used with terminals instead of solder posts.

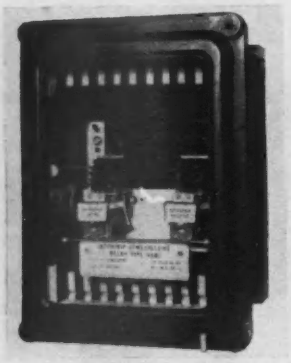
The excellent clarity of reading has been achieved by the use of a pointer some three times normal length in association with a platform scale to overcome parallax. Figures and pointer are white against an anodised black background. Being hermetically sealed—and nitrogen filled for some applications — they are non-fogging and the weight is only 2¼ oz.

The Series 125 is supplied for d.c. voltages from 50 mV to 250 V, a.c. from 2·5 V to 250 V and d.c. amps from 50 microamp to 5 A. Though obviously designed with high altitude aircraft applications in view, these instruments will be welcomed in many industrial applications. *Measuring Instruments (Pullin) Ltd., Winchester St, Acton, W.3.*

Intertripping relay

DESIGNED to comply with CEGB intertripping scheme requirements, the English Electric Type VAWJ relay is a hinged armature unit with three pair of normally open contacts, one pair of normally closed and a hand-reset operation indicator.

For a single-way scheme two identical relays would be used; for two-way schemes, with "send" and "receive" relays at each end, two relay units are mounted in a common case. A 50 V d.c. GPO pilot-wire connection is envisaged. The relay is also suitable for other duties. *English Electric Co., English Electric Hse, Strand, W.C.2.*



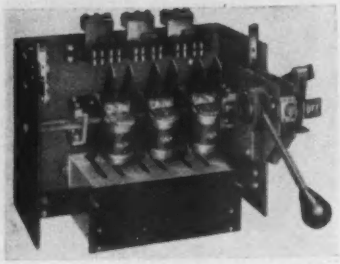
The type VAWJ English Electric intertripping relay

Range of new fans

FOLLOWING the introduction of their Torrington impellers, Smiths announce a complete range of blower casings to match existing Airotors made by their company. Units can be supplied with or without motors and suitably pierced to meet a wide variety of motor mountings. The range caters for air deliveries up to 4,000 c.f.m. and standard finish is in hammered blue/green. Recently introduced is a 2¾ in. dia tangential fan which is 7 in. long. It is capable of delivering an airflow sufficient to maintain "black heat" effect on a 2¼ kW element. The rotor is flexibly mounted for silence and it is of all-metal construction. At present only one size is available. The fan is compact and special mounting arrangements can be incorporated to meet existing appliance design requirements. *S. Smith and Sons (England) Ltd., Air Impeller Dept., Witney, Oxon.*

Switchgear for cubicles

TO the engineer making up his own cubicle-type switchboard for up to 600 V three-phase a.c. usage, the new "Cromwell" range of heavy-duty switch fuses introduced by the GEC is of particular interest. Designed to conform with BS 3185:1959, they have all the necessary attachments for building into a cubicle, but are not provided with a front cover or door. There are four ratings: 150 A, 200 A, 300 A and 400 A and the prices range from £28 to £52 10s. As the illustration shows, the cartridge-type fuselinks are mounted across the movable blades, which are of the double-break type, so isolating the fuse for replacement. The live contacts are totally enclosed and one of the blades at each end is so arranged as to break before the other, ensuring that at least one spring contact shall not be damaged by sparking. A quick-make-and-break mechanism is operated by a front-of-panel operating handle and a clear-flag indicator is fitted as standard. A Yale lock can be provided if required and an interlock prevents the door being opened with the switch in the "on" position. Dimensions, which are reasonably small, are detailed in publication X5464. *General Electric Co., Installation Equipment Group, Four Ashes, Wolverhampton.*



A unit from the "Cromwell" range of switch fuses

TRADE PUBLICATIONS

MORGAN CRUCIBLE. — Leaflet describing "Metamic" pyrometer sheaths, MRD1/61. Morganite Research and Development Ltd., Battersea Church Rd, S.W.11.

POWER CENTRE.—Pocket-sized booklet on uses and advantages of selected distribution systems. Power Centre Co. Ltd., Lloyd St, Wednesbury, Staffs.

PYE.—Leaflet describing new "Mercury" 20 W transistorised h.f. radiotelephone. Pye Telecommunications Ltd., Cambridge.

STERNOL.—Booklet entitled "Rust" detailing corrosion preventives. Sternol Ltd., Royal London Hse, Finsbury Sq, E.C.2.

THERMOCONTROL.—Illustrated leaflet detailing MT64 control motors. Thermocontrol Installations Co. Ltd., Valentine Pl, S.E.1.

T.M.C.—Leaflet detailing new solid state circuit elements. Telephone Mnfg. Co. Ltd., Martell Rd, West Dulwich.

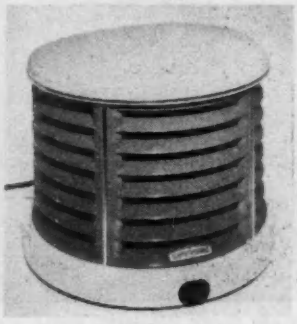
WALMORE ELECTRONICS. — Leaflet describing neon indicator units. Walmore Electronics Ltd., Drury La, W.C.2.

Varnish baking ovens

A RANGE of electrically heated ovens designed for impregnating and stoving varnished electric motors, transformers and coils has been introduced recently. The ovens can be supplied for shelf or trolley loading and rapid heating is said to be ensured by powerful forced-air circulation. The entire oven chamber is claimed usable without the risk of radiant heat burning the coil exteriors. Positive evacuation of varnish fumes is provided by an adjustable recirculation vent. If required, a recorder or timer can be supplied in the control circuit. The unit is provided with an excess temperature cut-out and totally enclosed low-rated heating elements. *Hedin Ltd., Fowler Rd, Hainault, Essex.*

Heater design transfer

MORPHY-RICHARDS are shortly to produce two fan heaters based on the tried HMV versions "Cavendish/Berkeley" and "Winchester/Salisbury." The designs have been transferred completely to M-R who will market and distribute these products. Deliveries of the "Cavendish" are scheduled for November and the "Winchester" will be available early next year. The "Cavendish" will be listed by M-R as the CVD and is priced at £10 12s 8d. Price and list classification for the "Winchester" model are not yet available. *Morphy-Richards (Cray) Ltd., 50 Conduit St, W.1.*



HMV's "Cavendish" heater, the design of which has been transferred to M-R

The Dairy, Show 1961

THIS year's Royal Dairy Show at Olympia presents again a wonderful selection of Britain's farm livestock and a representative display of the excellent and ingenious equipment which has been developed by industry in the UK for all branches of farming activity. There is, however, a stage in all industrial development when progress appears to have reached a standstill, such improvements as have been made being in detail rather than in any new line of development, and such a stage would seem to have been reached here judging from the paucity of new equipment and appliances on display. Only 26 entries were received in the inventions section, none of which was of an electrical nature.

Electric Trucks

On the stands, perhaps the most outstanding item of new design was the "Transitruck," the electric road vehicle by Smith's Delivery Vehicles with the revolutionary control and battery-charging system incorporating silicon-controlled rectifiers and printed circuits recently described in these pages. It is understood that a number of these very pleasingly designed vehicles have already been ordered.

Stanley Engineering Co. Ltd., on Stand B.35, also introduced a new design delivery truck, the "Manulectric 730," which claims to achieve a speed of 22 m.p.h. and a range of over 50 miles on a single battery charge. The bodywork is in aluminium with a glass-fibre cab-front, and the payload is 30 cwt. Austin Crompton Parkinson Electric Vehicles again featured their range of Morrison-Electricar delivery trucks, including the glass-fibre bodied Model EH and the "Elektruk" rider vehicle, which they have recently taken over. Another maker of electric delivery vehicles was W and E Vehicles Ltd.

Vending Machines

Automatic vending machines for the sale of tea, coffee, milk and fruit drinks seem to be increasing in popularity, with the Sankey "Vendo" range well to the fore. A new machine, to be seen shortly in service throughout the country, gives a selection from five drinks of tea and coffee, the former with or without sugar and the latter black with sugar or white with or without sugar, with a choice of retail charges. The capacity is 600 cups and it is claimed that this is an entirely new departure in the automatic vending field. The price is £375 and, of course, it incorporates electric heating. Other makers of vending machines, notably the Gloster Equipment Co., Gaskell and Chambers Ltd. and the Universal Cooler Co., appear to be concentrating on cold drinks, ices and similar goods.

Fences and Flowmeters

Electric fencing is another idea in which we often find new models and developments, but this year the only ones to be shown were tried models which first saw production a few years ago. Wolseley Engineering Co. and Curtis Padwick and Co., both of whom have a reputation in this field, were exhibiting again.

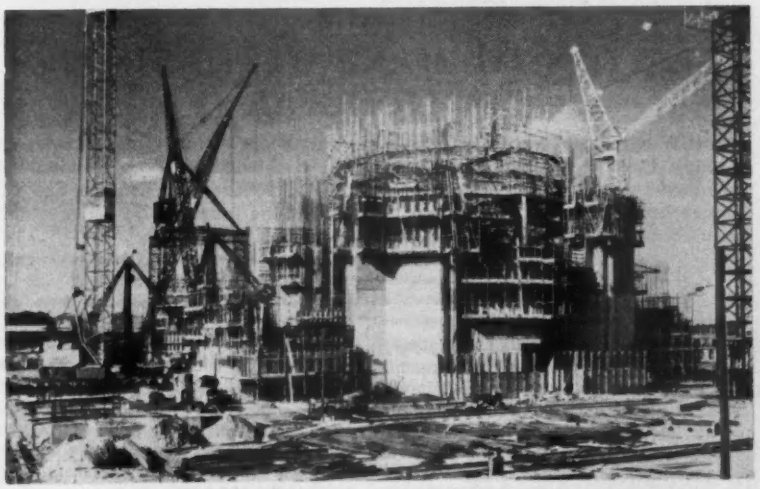
Electric flow-metering equipment was also in evidence on the stands of H. M. Hobson Ltd. and Meterflow Ltd. In each case, electronic pulse counting was the basic principle, but the latter company's models incorporated transistorised movements and printed circuit techniques.

The Electrical Development Association's stand featured electric in-barn drying of hay before storage and, by means of pictures, automatic electric milling of foodstuffs.

GOOD PROGRESS AT SIZEWELL

CIVIL engineering work on the two reactors for the Sizewell 580 MW nuclear power station is reported to be six weeks ahead of schedule. Work began at the site on the East Anglian coast about seven months ago and the station is scheduled to be operational by 1965.

The 8 ft thick foundation rafts for the reactors and the boiler houses have been completed and work will shortly begin on the turbine foundations. The concrete protective walls for No. 1 reactor are well advanced and work has also begun on those for the second reactor.



Construction on the Suffolk 580 MW nuclear power station. Work is well advanced on the reactor protective concrete and the main site excavations are nearing completion. In the right background is the Peine free-travelling crane which has 300 h.p. drives including Ward-Leonard hoisting units capable of lifting 10 tons

All main excavations have been completed for the turbine house, which will have two 325 MW turbo-alternators, and for the pump house, where work extends to 30 ft below sea level.

Tunnels are now being driven through sand to cooling-water intakes, which will be about 1,800 ft off shore. The inlet water culverts for the turbine house and the foundation walls are also under construction.

The Goliath crane components are now arriving on site from the Hinkley Point station and, when assembled, it will be used in conjunction with two German-built Peine cranes in the construction of the station.

Sizewell is being built by the English Electric, Babcock and Wilcox, Taylor Woodrow atomic power group. Work is proceeding on manufacture of the reactor pressure vessel plates and ring sections for the boilers at the Dalmuir factory of Babcock and Wilcox. Each reactor pressure vessel will be 63½ ft dia and the eight boilers will be 22½ ft dia by 91½ ft.

News of the Week

More Support for Calshot

Hampshire C.C. agree to 2,000 MW station

THE likelihood of a 2,000 MW oil-fired station being built on Southampton Water between Calshot and Fawley has increased as a result of Hampshire CC tentatively joining the ranks of those authorities who support the proposal. For the time being, Hampshire CC are maintaining their position of formal objection, but this is in order to negotiate certain amenity safeguards as distinct from opposing the basic plan. At a meeting on Friday, the Council's Planning Committee, headed by Lord Porchester, decided that they were now ready to approve the plan for the £70 million station provided there is no subsidiary industry, no jetty into Southampton Water, no second power station in the area and no overhead cables across the estuary. In particular, they are anxious about the future of land owned by the Air Ministry to the south of the site and including Calshot Spit.

Following Fawley Parish Council's decision last month to support the CEGB's proposal, Hampshire CC's change of heart means that the main objectors are now the New Forest RDC, although even here the opposition is only "conditional."

New Forest RDC consider that the site should be returned to the Green Belt unless there are overriding reasons for building the station on that spot. The Solent Protection Society also are extremely dubious about the proposal and say they would require many assurances.

One of the main objections has been the 600 ft high chimney which the station would have, and the massive building, but there is a considerable body of opinion that one well-designed chimney and building would be greatly preferable to miscellaneous development. At all events, it seems to be generally agreed that this plan is preferable to the earlier alternative of building a nuclear station on the Isle of Wight.

The CEGB are of the opinion that a well-designed station could mark an impressive entry into Southampton Water. The site itself embraces a considerable area of mud flats.

Telephone Merger Succeeds

£30 million Giant Born

PLESSEY'S takeover offers for Automatic Telephone and Electric Co. and Ericsson Telephones have been declared unconditional following more than 90% acceptance. As a result, Plessey's issued capital will jump from £13 million to £18¼ million, in addition to which the deal involves the issue of nearly £10 million of convertible loan stock and cash payments of a further £2 million.

With the new grouping, Plessey will be easily the largest manufacturer of telephone equipment in this country, and will probably handle something like 40% of the GPO's work. Annual earnings should be near the £10 million mark, before allowing for the sizeable rationalisation benefits now made possible.

E.E. and A.S.E.A. in d.c. power link

THE English Electric Co. Ltd. has concluded an agreement with ASEA (Allmanna Svenska Elektriska Aktiebolaget), of Sweden, providing for the exchange of patents and patent rights in the field of high voltage d.c. transmission. These two companies are probably the only firms outside of Russia which have carried out tests and work in that sphere.

A.E.I. EXTEND SCOTTISH LIGHTING FACTORY

TO increase their output of vacuum and miscellaneous types of gas-filled lamps, AEI Lamp and Lighting Co. are to enlarge by half their factory at Buckie, Scotland. Work on a 10,000 sq ft extension is expected to start early next year, and when completed the factory will employ an additional 60 people from this small Banffshire town.

The existing factory produces over 100 types of lamps, including all the company's decorative, tubular, telephone and GLS rough-service lamps, work with a high labour content. Opened in 1956, it stems from a conversation between the Rt Hon Thomas Johnston (then chairman of N. Scotland HEB) and AEI chairman Lord Chandos on the need to introduce additional light industries in the Highlands.

INSTRUMENT MAKER TO LIQUIDATE

LIQUIDATORS and a creditors' committee have been appointed for Walter Instruments Ltd., Morden, makers of "Walter" radio switches. A statement of affairs shows that £256,293 is owed to creditors, while cash and other assets are estimated to realise £120,446.

One of the largest creditors is Charterhouse Industrial Development, a member of the Charterhouse finance group. They are owed £106,774 as an unsecured cash creditor, and are represented on the creditors' committee along with AEI, Harwood Cabinets, Greencoat Industries and Mica Products.

CHILTON TO MAKE WESTINGHOUSE SWITCHGEAR

A NEW agreement signed between Mr Fuller-Shapcott, managing director of Chilton Electric Products Ltd., and Mr A. B. McCloskey, vice-president of Westinghouse Electric International, on 30 October gives Chilton Electric the exclusive rights to manufacture and market the range of De-ion moulded circuit-breakers, single- and three-phase, from 15 A up to 800 A, 600 V a.c. in the UK, with non-exclusive sales rights throughout the world other than the USA and Canada.

For the first few months, completely assembled breakers of American manufacture will be imported to meet initial demands, followed by a second phase of assembling breakers from imported component parts. The final phase, complete manufacture here, is estimated to be reached in about three years, by which time Chilton will have acquired the extensive background knowledge from the licensing company based on nearly 40 years of design and field experience with this type of breaker.

All of the moulded-case breakers are designed for use in control boards where they will take up a small fraction of the room of conventional switch-fuses of comparable rating. Their cost will be slightly below that of switch-fuses. They give single-phase protection from dual protective thermal elements and incorporate De-ion arc quenchers and quick-make-and-break action.

The new arrangement will considerably extend the British company's range of circuit-breakers and protective devices.

RADIO-FREQUENCY ROCK-BREAKING DEVISED BY AMERICAN G.E.

A NEW method of rock-breaking in mining has been developed which is safer and more economical than conventional blasting or explosive shot-firing methods, it is reported from the USA. Known as electrothermal forcing, the basic principle is to establish a low resistance path through the rock by passing a high-energy r.f. current between electrodes clamped to the face of the rock. The r.f. current acts on the water content of the crystalline structure of the rock and the path, once established, then serves to carry a heavy d.c. current between the electrodes which sets up high thermal stresses sufficient to split the rock along the line of the path. With metal-bearing ores the process is more rapid than with virgin rocks such as granite but it is claimed that these, too, are capable of accepting the new technique.

The development is due to the Industry Control Section of the General Electric who estimate that more than 300 mines in the US could use the system economically. Estimates of power required are of the order of 25 kW in the 20 mc/s to 40 mc/s range and it is said that a commercial model of the equipment could be sold for just over £21,000.

'Fridge Trade bearing up

STEADY trade in refrigerators continued in August, with manufacturers delivering 52,547 to the home market. This was 2·6% less than a year earlier, but still enough to hearten manufacturers after the dismal start to the season. The expected downturn from July, when deliveries were boosted to 108,130 by the pre-"Little Budget" rush and were 10·3% higher than in the previous July, has not been as sharp as some had feared.

Another hopeful sign is a partial recovery in exports. Deliveries to overseas markets in August totalled 7,458, 2·5% less than a year ago, whereas July's shortfall was 24·2%.

Engineering output steady

OUTPUT of the industries producing engineering and electrical goods in July and August was 9% higher than a year earlier, the BoT index shows. The two months are taken together to eliminate the effect of the later holiday shut-down this year. This was the same increase as in May and June, continuing the higher volume of production evident throughout the second quarter.

Home order books at the end of August were slightly shorter than a month earlier, but export order books were a shade longer, although July's spurt in new export orders was not repeated.

Electricity Causes More Fires

THE number of fires in buildings associated with the use of electricity was up again in 1960, show figures based on fire brigade reports, published this week by HMSO. There were 11,912 fires attributed to electricity as a source of energy, compared with 10,460 in 1959. In 1960, town's gas was the cause of 2,912 fires, oil of 4,812 and solid fuels of 11,476.

The notes accompanying the report remark that the major part of the increase of 1960 over 1959 comes from fires associated with cookers. (In these, of course, it is usually the food being cooked that catches fire, not the cooker itself.) There is also a big increase in the miscellaneous classification. Otherwise, the electrical figures show relatively small changes up and down.

Fires of Electrical Origin

Supposed cause of fire	1959	1960
Cooker	1,864	2,512
Heater, etc. ..	1,248	1,344
Iron	236	204
Motor	316	260
Refrigerator ..	732	648
Wire and cable ..	2,936	3,220
Wireless, TV ..	756	872
Other Apparatus ..	2,336	2,852

The published tables further relate the fires to the type of hazard in which they started. Taking only fires in England and Wales, it is shown that the great majority of the cooker fires occur in private dwellings. Only about two-thirds of the space-heating fires are in this category. These more detailed tables make an informative split between fires originating in fixed wiring (2,932) and those originating in leads to apparatus (380). About half the fires occurred in private dwellings in each case.

Scottish F.B.I. Favour More Hydro Power

SCOTTISH industry would best be served if hydro power were increased to the point where it supplied the peak load, leaving thermal stations to cope with the base load. This is the view of the Scottish Council of the FBI expressed in evidence to the Government Committee on electricity in Scotland.

Dept. of Automation Suggested

A DEPARTMENT of Automation should be organised on a national basis, suggested EDA's industrial specialist, Mr L. Landon Goodman, when he addressed a British Institute of Management conference last week on "management and automation." The department should be representative of trade unions, management and the Government. Its aim should be to deal with the problems that automation is bringing and to speed its introduction.

An alternative to this approach might be the strengthening of the existing department of the Minister for Science; but Mr Goodman does not think this department should have the automation organisation under its charge.

The problem has been tackled in a variety of ways in other countries. In the USA an Office of Automation has been set up to deal with labour problems —technical matters are handled elsewhere. Russia established a Ministry of Automation about five years ago. Germany has an Institute of Automation. It seems to Mr Goodman advisable that the UK should also establish a central body, to focus attention on the importance of automation, to stimulate progress and research, and to co-ordinate the many and varied activities in the wide field that automation covers.

Bill Switchgear's New Branch

Interior of part of the new offices and stores of Bill Switchgear Ltd. at Brislington Trading Est., Bristol. Of modern design with two-storey frontage, the premises have offices and showrooms on the upper floor, with Stores and Dispatch Dept. on the ground floor. The branch is in charge of the area manager, Mr W. L. White

G.E.C. RECONSTRUCT TELECOMMUNICATIONS GROUP

THE Telecommunications group of GEC is the latest to be reconstructed under the new policy of placing operations under the control of subsidiaries. The activities of this group are being taken over by GEC (Telecommunications) Ltd. and GEC (Electronics) Ltd., two of the several new subsidiaries named recently, with co-ordination and direction being provided by a third new company, GEC (T and E) Holdings Ltd.

Headquarters of GEC (Telecommunications) Ltd. will be at the GEC Telephone Works, Coventry. On the other hand, GEC (Electronics) Ltd. will have headquarters at Union Works, Wembley, and other production units at Coventry, Broad Oak and Portsmouth. GEC (T and E) Holdings Ltd., centred in London, will take a number of older subsidiaries into its fold as well as the two new ones. These are: The M-O Valve Co. Ltd., Salford Electrical Instruments Ltd., Watson and Sons (Electro-Medical) Ltd., Machlett X-ray Tubes (Great Britain) Ltd., and the Semiconductor Division.

Another new development affecting GEC is the registration of Lamp Metals Ltd., with capital of £750,000, an equal partnership between AEI and GEC to integrate their manufacture of metal components for lamps and valves. This is continuing the policy of integration begun 15 years ago when Glass Bulbs Ltd. was formed. The decision to form other joint companies for glass components not already covered by Glass Bulbs Ltd., and for molybdenite and tungsten products, has already been announced.

OFFICIAL PUBLICATIONS

First Trial on the Use of Thermal-storage Block Heaters in Dwellings. Utilisation Research Report 24. Electricity Council (see page 643).

UK Fire Statistics, 1960. Report of DSIR and Fire Offices' Committee JFRO. HMSO, 12s 6d (see p. 663).

Money for Effort. DSIR Problems of Progress in Industry series. HMSO, 1s 9d.

Lighting and Wiring of Churches, 2s 6d; Part II (separately), Electric Wiring in Churches, 6d. Church Information Office (see page 646).

LARGE CONTRACTS AWARDED

A CONTRACT worth £178,000 has been awarded to AEI to reinforce the supply between North Wilford generating station and a new substation at Isandula Rd, Nottingham. The contract involves supplying materials for, and erecting, nearly a mile of double-circuit 132 kV o.h. line on six towers of J. L. Eve design, plus two 4,100 yd lengths of three-core oil-filled 132 kV underground cable and associated pilot and telephone cables.

THREE axial-flow compressors to supply compressed air for a large-tonnage oxygen plant in Poland have been ordered from Hawker Siddeley Brush Turbines Ltd. by Constructors John Brown Ltd. The compressors are to be electrically driven (approx. 6,000 h.p.).

FOUR high-pressure glandless motor pump units have been ordered from Hayward, Tyler and Co. by Machinoimport, Moscow. Similar to those supplied for High Marnham, Thorpe Marsh and Blyth "B" power stations, two of the units are to be of 650 h.p. and two of 300 h.p. operating at 2,840 p.s.i. system pressure.

THE AEI Heavy Plant Division is manufacturing eight gas blowers to be installed in Dungeness nuclear power station. Each blower, driven by an AEI back-pressure steam turbine, will absorb approximately 9,000 h.p. at normal speed, and will be capable of dealing with 1¼ tons of carbon dioxide/sec. A pony motor, rated at 300 h.p., will be incorporated with each unit.

FOR use in connection with Tanganyika's independence celebrations next month, nearly 20,000 colour-glaze lamps, in four colours, have been ordered from Crompton Parkinson Ltd. The order was awarded by the Crown Agents in competition with other manufacturers.

DICTOGRAPH Telephones Ltd. have secured a £17,000 order from Rubery Owen and Co. for sound distribution equipment. Comprising 620 speakers mainly for staff location use, the system is regarded as important with the advent of subscriber trunk dialling.

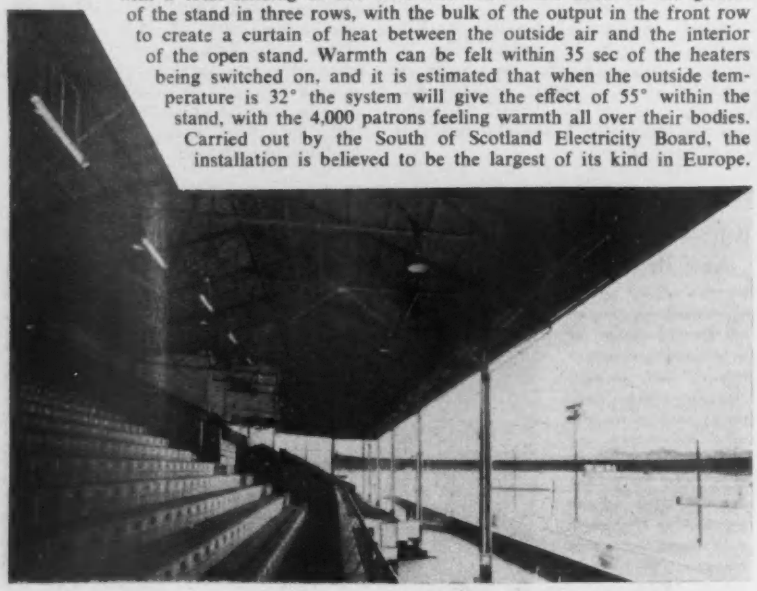
CABLES worth £365,500 for Thorpe Marsh power station have been ordered from Pirelli-General Cable Works Ltd. by the CEGB Northern Project Group.

ELECTRIC control equipment for a new flour mill at Sark, in Turkey, has been ordered from Brookhirst Igranic by Henry Simon Ltd.

AN order for a 7 MW double-passout condensing turbo-generating set for a pulp and paper mill at Plaski, Yugoslavia, has been placed with GEC (Engineering) Ltd. by Millspaugh Wimpey.

250 kW of Overhead Heating at Glasgow

SPECTATORS in the main stand at Shawfield Stadium, Glasgow—home of Clyde Football Club and a popular venue for greyhound racing—are now sure of a warm welcome. A system of overhead infra-red heating has just been installed, comprising 84 Thermodare heaters ranging in length from 2 ft to 5 ft and from 800 W to 4 kW, with a total loading of 250 kW. The heaters are fixed on the girders of the stand in three rows, with the bulk of the output in the front row to create a curtain of heat between the outside air and the interior of the open stand. Warmth can be felt within 35 sec of the heaters being switched on, and it is estimated that when the outside temperature is 32° the system will give the effect of 55° within the stand, with the 4,000 patrons feeling warmth all over their bodies. Carried out by the South of Scotland Electricity Board, the installation is believed to be the largest of its kind in Europe.



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Strike Threat in Power Supply

WILL manual workers in the Electricity Supply Industry withdraw their labour at an early date? This is a strong possibility following the deadlock ending of talks on the pay increase claim last Thursday when a new offer by the employers' side was rejected by the union representatives.

The offer put forward by the employers' side last week was rejected because it was "completely inadequate" compared with the unions' claim for a £2 a week rise. It proposed that all manual workers with three or more years' service at 1 April next should be placed on a weekly wage, increments ranging from 5s to 8s 6d a week according to their grade. Further similar increments would be given after two and four more years' service. In addition, all employees on grades A to F, inclusive, would get an extra 1d an hour, and on grades G and H, 1½d an hour.

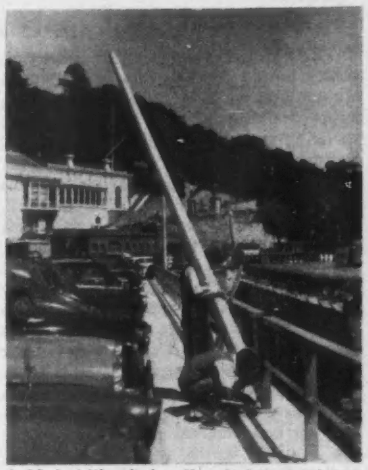
After that lengthy meeting the latter indicated that the Government "pay pause" was to blame for the breakdown. The employers' side had taken its stand because of the country's serious economic situation, and Mr C. T. Melling, deputy chairman of the Electricity Council, said they could not justify increases now, for other industries would follow and inflation would continue.

But that type of appeal received short shrift from the union chiefs, some of whom have suggested the staging of a strike of the employees.

But as two Acts—the Protection of Property and Conspiracy Act, 1875, and the Electricity Act, 1919—prohibit such a collective action, the unions are proposing that each individual should give the management one week's notice, to operate on an agreed date.

The unions plan to distribute special forms to the men for this purpose and local meetings are being arranged to formulate strike plans. At Newcastle upon Tyne, for instance, workers in the power stations have decided that in the event of a stoppage over the wage claim, skeleton staffs would continue to work, without wages, to ensure adequate electricity supplies to hospitals.

In the face of such plans, other moves may be expected in an effort to avoid such a clash. But it should be remembered that last week's meeting was of the negotiating committee, and the matter would normally be considered again at the full meeting of the NJIC, scheduled for 16 Nov., but whether the union representatives will attend that meeting is uncertain at this stage.



A 15 ft Miles light alloy lighting column being placed in position on the Beacon Quay multi-storey car park, Torquay. The columns are bolted to the concrete slab, and Atlas Gamma lanterns fitted

WAGE CLAIMS

THERE have been eight claims to arbitration from the electricity supply industry since 1955. This is borne out in statistics involving staffs of nationalised industries. A similar number of claims have been submitted by the gas industry and 18 have been made by the coal industry.

Vernon to Complete Contract

OUTSTANDING Ministry of Aviation contracts with Vernon Industries which were taken over by Petbow Ltd. in July are valued at £130,000. Vernon Industries have retained the responsibility of these contracts which are being completed at Kirkby. None of the contracts have been transferred to Petbow's Kent factory following the decision to close Vernon's plant at Kirkby.

Minister sees Benefits for Coal in Steel Community

IF Britain joined the European Coal and Steel Community it would confer benefits on both the National Coal Board and consumers, MP's were told last week during a debate on the coal industry. The industry would benefit from an expanded market and consumers could expect the benefit of having wider sources of supply.

Although in the first half of this year the Board has made a small surplus of £2½ million, it is certain that there will be a further deficit over the whole year. The accounts for 1960 showed a £21 million deficit and an accumulated loss at the end of that year of £78 million. Even a small loss at the end of this year will bring the Board's accumulated deficit beyond its probable internal resources and the £20 million borrowing limit taken together. On a more heartening note, undistributed stocks will probably be reduced by between 7 million tons and 10 million tons. Deep-mined production is likely to be about 5 million tons less than last year due to a number of factors, not the least being the drop in manpower in the industry.

The intention of the Board two years ago to reduce open-cast production to a low level has now changed to the need for increased production to meet demands. The output of open-cast coal this year is likely to be in the region of 8 million tons. The Board has decided to postpone its rundown of this form of mining and for the time being keep it at its present level.

B.P. in Fuel Cell Partnership

ANOTHER presage of a commercial version of the fuel cell is the formation of a new company, Energy Conversion Ltd., to promote research into this chemical method of producing electricity. Equal partners in the new company, which has an initial capital of £200,000, are British Petroleum, British Ropes, Guest Keen and Nettlefolds, and from the governmental side, the National Research Development Corporation. Energy Conversion will recruit research staff in the near future and launch an intensive programme aimed at developing a commercially practicable fuel cell. Shell, also, are working on this problem at their Thornton Research Centre.

Two New Companies

THE Electrical Components Division of Smart and Brown (Machine Tools) Ltd. is being changed in name to Sabel Connectors Ltd. and will soon be shifted from works at London Rd, Biggleswade, to other accommodation yet to be found. This follows the sale to The Tap and Die Corp. of the London Rd works, the subsidiary Pultra Ltd., and certain machine tool interests. Smart and Brown (Machine Tools) is a member of the Gas Purification and Chemical Co.

★ ★ ★

E. SHIPTON (Holdings) have formed Shipton Automation (Sales) Ltd. to handle all the marketing activities of their operating subsidiaries, E. Shipton and Co., R.F. Electronics Developments, and English Telephone Co.

Investment in Supply

INVESTMENT levels in the supply industry during the financial year 1962-63 are announced in a Government White Paper published on Tuesday. Total spending by the English, Welsh and Scottish boards is to be £397 million. Broken down for individual boards, this comes to £217 million for the CEGB, £118 million for the English and Welsh area boards. The CEGB is, in addition, expected to spend £20·6 million on nuclear fuel for initial charges in power stations. Scottish spending is estimated at £22 million for the S of S EB, plus £5·5 million for initial charges of nuclear fuel, and £13·5 m for the N of S HEB.

CEGB spending includes £70 million on nuclear stations as against £87 million on conventional power stations. In the S of SEB, the relative figures are £5·8 million and £4·5 million.

In the current year, CEGB spending (excluding nuclear fuel) is put at £206 million, area boards at £110 million. The two Scottish boards are estimated to spend £25·5 million and £12·8 million, south and north respectively.

E.D.A. Public Speaking Contest

THREE interesting and varied subjects have been chosen for the 1962 EDA Public Speaking Competition. They are "Advertising with a Purpose," "The Salesman as the Consumer's Friend," and "Where Would You Put the Pylons?" Alternatively, a free subject, connected with electricity utilisation, may be chosen by competitors in the supply industry under 35 years of age. Closing date for entries is 1 Dec. The national finals will be held in London next May.

A.E.I. Lighting in Chelmsford showroom

AT the newly rebuilt Chelmsford showrooms of the Eastern Electricity Board an illumination level of 100 lumens/sq ft is achieved by combining AEI fluorescent fittings and an illuminated ceiling with surface mounted cupola and recessed eyeball spotlights. Over 100 5 ft 80 W Monolux fittings are mounted above 900 sq ft of Isora ceiling. The Board's own staff carried out the wiring and installation of the lighting equipment.

£337,500 PLAN FOR N. IRELAND

REINFORCEMENT of the distribution system in the Carnmoney area at a cost of £337,532—needed because of housing and industrial growth—is proposed by the Belfast Corporation Electricity Committee. Application is to be made to the Ministry of Commerce for consent to raise the required loan. Reporting on the position, Mr. R. P. Watson, city electrical engineer and general manager, states that the demand in the Carnmoney area will increase rapidly in the near future because of active development of housing and new industries, in particular the new factory estate at Monkstown, where substantial power supplies will be needed during 1963. It is proposed to establish a new substation in the Whiteabbey area which would take supply from the line between Ballylumford and Finaghy switching station. The necessary agreement of the Joint Electricity Committee for the tapping of that line had been obtained. The town clerk and the city electrical engineer have been requested to make representations to the Ministry for either a subsidy or grant towards the cost.

Tower Rentals

TO meet the situation introduced by the larger grid line towers that will be associated with 400 kV lines, the CEGB and the landowners' and farmers' associations have agreed on a revised and extended scale for annual rent payments and for compensation for interference with agricultural operations.

Dimension of	*Arable Land p.a.*	*Cultivated Grass Land p.a.*
17 ft 6 in. x 17 ft 6 in. but under 20 ft x 20 ft	35s	8s
20 ft x 20 ft but under 25 ft x 25 ft	40s	8s
25 ft x 25 ft but under 30 ft x 30 ft	50s	12s
30 ft x 30 ft but under 35 ft x 35 ft	65s	12s
35 ft x 35 ft but under 40 ft x 40 ft	85s	12s
40 ft x 40 ft but under 45 ft x 45 ft	110s	16s
45 ft x 45 ft but under 50 ft x 50 ft	140s	16s
50 ft x 50 ft but under 55 ft x 55 ft	175s	20s
55 ft x 55 ft and over	215s	20s

Rentals—Payable to owner.

For each tower with base dimensions over concrete at ground level of:

Under 15 ft x 15 ft	4s p.a.
15 ft x 15 ft but under 25 ft x 25 ft	7s 6d p.a.
25 ft x 25 ft but under 35 ft x 35 ft	10s p.a.
35 ft x 35 ft but under 45 ft x 45 ft	15s p.a.
45 ft x 45 ft and over	20s p.a.

Compensation for Interference For each Tower with Base Dimension of	*Erected on Arable Land p.a.*	*Erected on Cultivated Grass Land p.a.*
Less than 10 ft x 10 ft	18s	4s
10 ft x 10 ft but under 12 ft 6 in. x 12 ft 6 in.	22s	4s
12 ft 6 in. x 12 ft 6 in. but under 15 ft x 15 ft	26s	4s
15 ft x 15 ft but under 17 ft 6 in. x 17 ft 6 in.	30s	8s

VISIT TO MILAN LABORATORIES

MEMBERS of the electricity boards' *ad hoc* panel on arc suppression coils and auto-reclosing switchgear visited the CESI laboratories in Milan last month as guests of Johnson and Phillips Ltd. to see a new series of tests on the J and P type "D" expulsion fuse-switch. This fuse-switch, introduced many years ago, has undergone considerable development and testing over recent years, resulting in its uprating to 150 MVA at 11 kV. We reported on 12 Jan. last our visit to the Milan laboratories to see tests on this unit. Similar tests were witnessed last month by the boards' engineers. Our picture below shows the members of the panel with J and P officials. Left to right: Mr A. C. Bryant (Newcastle branch manager); Mr P. M. Wilson (chief engineer, SWEB and chairman of the panel); Mr W. Bowman (YEB); Mr A. H. Proctor (SWEB); Mr A. Formica (CESI); Mr P. T. Davies (manager, J and P Switchgear Dept.); Mr R. L. Stanley (J and P plant sales manager); Mr F. H. Waggott (NEEB); Mr S. H. Money (S. of SEB); Mr R. A. W. Connor (EEB); Mr J. Harris (MEB); and Mr W. S. Boone (J and P Publicity Dept.).

Members of the boards' ad hoc panel on arc suppression coils and auto-reclosing switchgear, with J. and P. officials, outside the CESI laboratories, Milan, after the tests

"SURVIVAL"

A SCAFFOLDING plank breaks. A body hurtles through the air to be impaled on concrete reinforcing rods 100 ft below. The man survives, but without one arm and one leg for which he would willingly have sacrificed the £6,000 compensation. His mates all argue as to who is to blame; it is always "they" and not "me." Safety officers are appointed, but there is the usual "old hand" who looks down on such measures and tempts the younger man to take another risk, this time with fatal results.

Such is the theme of "Survival," a 16 mm 23 min film in black and white with sound which has been commissioned by the CEGB. Copies will be available from the CEGB at Winsley St, W.1.

I.E.S. Code Expounded by Two Firms

TWO new booklets which are intended to expand on the IES new Code of Recommendations have been announced. Each is from a major lighting fittings manufacturer, GEC and Thorn.

The intention behind the GEC brochure is to amplify the technical data in the Code in such a way that its recommendations in terms of calculations involving lighting planning are clearly set out. The booklet also includes the IES Technical Report No. 2. Thorn's new book, "The Atlas Lighting Manual," is a comprehensive textbook on lighting equipment and practice which has been prepared by 12 experts in lighting technology. In its present form it is a loose-leaf edition in a leather binding.

Johnson, Matthey in Belgium

FOLLOWING the acquisition of manufacturing and trading interests in France, Holland, Italy and Sweden over the past five years, Johnson, Matthey and Co. have now increased their link with Pauwels Frères SA, of Brussels, into a majority shareholding. As a consequence, Pauwels, established in the precious metals business since 1864, is being renamed Johnson, Matthey and Pauwels SA.

Sayings OF THE WEEK

"It is often preferable to develop a new idea and put it into practice without heralding it with a patent application which enables competitors and even customers to apply all their efforts to circumvent the patent instead of working on their own original ideas." . . . SIR KENNETH HAGUE, Babcock and Wilcox chairman, in his presidential address to the I.Mech.E.

"It must be emphasised that few electrical contractors have much knowledge of the art of lighting." . . . Statement in Church Information Office publication.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, October 31

	£ per ton	Weekly change £
COPPER, standard class A (settlement) ...	228	−1
" (3 months)	228½	−¾
LEAD, refined pig, 99·97% purity (cash)	61½	−½
" (3 months)	62½	−½
TIN, refined, min. 99·75% purity (settlement)	964	+20
(3 months)	964	+15
ALUMINIUM, ingots 99-99·5% ...	186	—
" wire bars (4×4×54")	193½	—
BRASS Strip 63/37	195½	−3
SILVER (Troy oz)	80d	—
ZINC, virgin, min. 98% purity (cash)	71½	+½
" (3 months)	72½	+½
RUBBER, per lb No. 1, RSS, spot	22½d	−1½d
c.i.f. basis, ports, Dec. ...	22½d	−1½d
ARMOURING: Galv. Steel Wire (0·104 in.) ...	68½	—
Mild Steel Tape (0·04 in.) ...	53½*	—
NICKEL (home)	660	—
MERCURY (76 lb flask)	60	—
AMERICAN PRICES: Copper, electrolytic (per lb) ...	31c	—
Lead (New York)	11c	—

* *Tape Price, now an average, includes varnishing*

A.E.I. VIEW OF INDIAN SCENE

INDIA plans to increase her installed generating capacity in ten years from 5,700 MW to 23,000 MW by 1970-71. As part of a vast development plan and to implement this target, the Government of India has established the Heavy Electricals factory at Bhopal. At their October luncheon The Batti-Wallahs' heard some of the background and the difficulties to be overcome in fulfilling the plan and of the backing given to the Bhopal factory by British electrical interests. The speaker was Mr C. P. Storr, M.A., assistant to the Director of Engineering, AEI Overseas.

Mr Storr said the decision to help in setting up a company which would eventually compete for custom in India was based on the philosophy that India intended anyway to establish a heavy electrical industry, and that British aid would bind India more closely to our engineering practice. The country was, however, desperately short of technical supervisors at both managerial and lower levels. His company had helped in preparing training schemes and one now being operated entirely by Indians was training 3,000 artisans of all grades.

The next luncheon will be on 30 Nov.

Harland in Canada

THE Canadian operations of the Harland Engineering Co. Ltd., previously handled by Bepco Canada Ltd., have been taken over from 1 Nov. by the Harland Engineering Co. of Canada Ltd., with head office in Montreal. General manager and director is Mr J. A. Cumming.

F.H.O.S.A. Dinner

FARADAY House Old Students' Association again held their annual dinner at Quaglinos last Friday when some 150 old students and their guests attended. The toast, "Faraday House," was proposed by Mr G. S. C. Lucas, O.B.E., F.C.G.I., M.I.E.E., president of the IEE and was responded to by Mr F. A. Bell, governor and deputy chairman of Faraday House. The president of the Old Students' Associaton, Mr G. S. Buckingham, B.SC., M.I.E.E., proposed the toast of "Our Guests" and awakened memories of many present in a witty word picture of the great Dr Alexander Russell lecturing at the board in his, the president's, student days. Sir Dennis Proctor, K.C.B., Parliamentary Secretary to the Ministry of Fuel and Power, responded.

News in Brief

The Pilkington Committee's report on television services is expected to be published in the early spring.

As part of a plan to save £750,000, the Minister of Labour intends to close the Ministry's Technical and Scientific Register, it has been stated.

A bust of John Logie Baird, inventor of television, was unveiled at Helensburgh last Saturday.

The new £200,000 Central Research Dept. of British Ropes Ltd., Doncaster, was officially opened last Friday by Mr Niall Macpherson, M.P., Parliamentary Secretary to the BoT.

The Association of Managerial Electrical Executive, Merseyside and N. Wales and North Western Centres, held their annual dinner at Southport last Thursday.

The Chloride Electrical Storage Co. Ltd. are to establish a battery factory in Buenos Aires.

Long-service awards to a further 229 employees who had completed 25 years' service with the firm were recently made by Sir Harold Wernher, chairman of Ericsson Telephones Ltd.

EIBA (Sussex Centre) are holding their annual ball at the Grand Hotel, Brighton, on 26 Jan. Tickets, 32s 6d each, from T. H. Batchelor, 10 Queen's Gdns, Hove.

The Royal Commercial Travellers' Schools are holding a Dickens Night at the Worshipful Company of Fishmongers on 7 Dec. Tickets, 10 gn.

Company Activities

GILTS *versus* equities. This was the tug-of-war setting for last week's stock market operations and this is the play we are likely still to witness, at least until Bank Rate is once more reduced from its present level of 6½%. There is not much doubt that the new-found firmness of Government stocks will continue at least over the short term. In the foreign exchange market the £ is now strong. A large measure of this strength can be accounted for by the foreign funds flowing into London to take advantage of the 6½% Bank Rate, only recently cut from 7%, and although much of this inflow may be described as "hot" money it has not prevented Britain repaying £100 million of its £535 million International Monetary Fund loan taken up in the crisis days of July last. And with Bank Rate still at 6½% foreign funds can be expected to continue to come into Britain seeking the profitable haven of Government stocks, Treasury Bills and local authority loans. The home operator, too, offered well in excess of a 6% income on Government paper, but also aware that he will have to make hay before a 6½% sun shades down to 6% or lower, is also finding the gilt-edged market currently attractive.

And that, of course, is not the only pull the equity market is now fighting. There is the whole clouded outlook for industry, the Chancellor's reiterated promise of a capital gains tax and the prospects of still more strikes, including one by the 120,000 manual workers in the generating and electricity distributing stations. All things considered, therefore, the equity market did very well to give only a fractional amount of ground last week.

The electrical market as a whole may have yielded an inch or two but even then there were still a number of bright spots. AEI slipped from 30s 6d to 29s 9d, English Electric from 28s 9d to 27s 6d and GEC from 25s 3d to 24s 9d. Thorn gave ground at 56s 3d and ICI finished 1s off at 88s 9d. Other issues to give ground included Berry's, BEI, EMI, Hoover and Ultra, which were marked back from 19s to 17s 3d before they recovered to 17s 6d.

On the brighter side, Ever Ready lit up from 37s to 38s, Decca Ordinary went from 57s 6d to 58s 3d before closing at 57s 9d and Dimplex, the heater business, after the chairman's company meeting comments moved up, ex the two-for-three free scrip issue, from the equivalent of 50s 7½d to 54s 3d, a new all-time "high" and equivalent to 90s 6d before the scrip issue.

In response to company news items, Elliott-Automation saw their 5s Ordinaries drop from 35s 3d to 34s 3d on the announcement that the board had arranged a further placing of £1·5 million 6½% Debenture stock 1981-86 at £95½%. The issue is being made in accordance with the board's policy of financing current expansion by the issue of prior charge capital and the proceeds of the issue will be used to reduce bank overdrafts.

Most encouraging news of the week was supplied by Crompton Parkinson, who not only maintained their 12½% dividend with a 7½% final but also reported a trading surplus for the year to June of £2,722,000, against £2,509,000 previously. After a higher tax bill, the group net income was still up from a previous £1,261,000 to £1,306,000, so that the company's 5s Ordinary shares obliged with a 6d improvement to 12s 3d.

Also from the trading front, Aberdare Holdings, which controls South Wales Switchgear, made an estimate that this year's pre-tax profits are expected to show a rise of about 15½% on 1960's £641,000 and there is to be a one-for-three free scrip issue and simultaneously a two-for-five "rights" issue at par in 5s Ordinary shares. But for the market tug-of-war last week, the present shares might have moved up more than they did from 16s 3d to 17s.—*From our City Correspondent.*

Aberdare Cables Africa

South Africa's secession from the Commonwealth has not harmed this company's trading judging by the preliminary profit announcement. Profit after tax has doubled from R120,140 to R238,496 for the year to June, while dividend is again 7½%.

Aberdare Holdings

As foreshadowed, the issues turned out to be one-for-three scrip and two-for-five at par, and shareholders are unlikely to be disappointed, especially as a final dividend of 8% is forecast as against 10% on the old capital last year. The chairman also expects profit before tax to be some £100,000 higher for the year, and reports that the orders and work in hand in all departments are well in excess of the previous year's figures.

B. and F. Carter

Buoyant demand for plant and machinery is reflected in higher earnings for the year to 31 July, coupled with an increase in dividend from 12½% to 15% and a one-for-two scrip issue. After tax, profit improved from £20,306 to £24,887.

British Electric Resistance

A one-for-ten scrip issue is announced with the preliminary results, following a one-for-four free issue last year. As forecast, dividend is the same as last year at 17½%, while profit before tax advanced from £72,179 to £78,820. Net profit comes out at £41,120 (previously £38,779) of which the net dividend absorbs £24,118.

Crompton Parkinson

The board's decision not to sacrifice efficiency to expansion has evidently been the right one in the present context. In contrast to the general trend in the industry, profits continued to advance in the latest year, though on a modest scale. Trade surplus is up from £2,509,000 to £2,722,000, and consolidated net income from £1,261,000 to £1,306,000. Dividend is maintained at 12½%, which is more than twice covered.

Dowding and Mills

Nothing in the post-war years has prevented this company's profits from rising steadily and the year to June is no exception. Before tax, earnings are £186,802 against £149,366 previously, while profit after tax is £87,984 (£75,175). Dividend is raised by 1d to 5½d a 1s share.

Elliott-Automation

A further £1½ million of 6½% 1981-86 debenture stock is being placed at 95½% through Philip Hill, Higginson, Erlangers and Hambros Bank. The stock will be identical with the £2½ million already issued and will be used to reduce overdrafts.

W. H. Sanders (Electronics)

Announcing a one-for-four issue of 2s Ordinary shares at 11s each, directors forecast that the dividend in the current year will at least match last year's 17½%, with the new shares ranking fully. Net proceeds of the issue will be £134,000, of which £50,000 will be used to reduce overdraft and the remainder to provide additional working capital and finance the acquisition of more factory space. Demand is in excess of capacity, directors state, and negotiations for further premises are under way.

Dividends Announced

Allen West. Interim 5% (*steady*).

Automatic Telephone and Electric. Special interim 8%.

Ericsson Telephones. Interim 6½%, as forecast.

Laurence Scott and Electromotors. Interim 3d (*same*).

Stone-Platt. Interim 4% (last year 4½%). It is too early yet to forejudge 1961's results, directors add.

Simms Motor and Electronics. Interim 5% on capital increased by one-for-ten scrip and one-for-six rights issues (previous equivalent 4·5%).

OVERSEAS NEWS

from our correspondents abroad

CANADA

Generator Order

An order for three 115,000 kVA generators for the Grand Rapids hydro-electric project has been placed with Canadian General Electric Co. by the Manitoba Hydro-Electric Board. Civil construction work on the project has already started at the site on the Saskatchewan River some 250 miles north west of Winnipeg. A contract for three Kaplan turbines for the station was awarded to the English Electric division of John Inglis Co. early this year and these are being built at the Toronto factory. The first set is scheduled for commissioning in 1963.

More Water Wanted

A proposal for increasing the diversion of water from the Niagara River for further power production has been referred to the International Joint Commission. The proposal has been put forward by the Hydro-Electric Power Commission, of Ontario, and the New York State Power Authority, who maintain that the additional water could be diverted without detracting from the beauty of the Falls. Ontario H-EPC say this is the last undeveloped source of hydro-electric power in southern Ontario or northern New York.

Tunnel Repair

After a three-month shutdown, the Kemano hydro-electric plant of Alcan has just returned to full operation. The smelter plant has been operating on emergency power while round-the-clock repairs were carried out to the tunnel which became blocked by a rock fall.

IPEC Shares

The British Columbia Electric Co.—now province-owned—has increased its holding in International Power and Engineering Consultants Ltd. to 40% of the issued capital, having purchased most of the interest formerly held by Balfour Beatty and Co. Ltd. But at the express wish of the Government the latter concern is retaining a 10% interest in order that its know-how and advice can be made readily available to the province when the Peace River development is taken up. The remaining 50% of the capital of IPEC is still retained by the British Columbia Power Corporation Ltd., who evidently do not wish to jeopardise efforts to secure an improvement in the expropriation terms for the British Columbia Electric Co. By the latest share changes the BC Government holds five of the eight seats on the board of IPEC. Originally, International Power and Engineering Consultants Ltd. was formed with the intention of acting as consultants for projects in any part of the world, and although it would now seem that its activities are likely to be confined to Columbia, its future is somewhat uncertain at this stage.

U.S.A.

Turbine Order

The English Electric Corpn., of New York, has won an £890,000 order for four 35,000 h.p. 90 r.p.m. Kaplan water turbines for a new dam to be built by the Grand River Dam Authority, Oklahoma. They will be manufactured by English Electric's Canadian associates, the John Inglis Co. Ltd., of Toronto, but the design work will be done at the company's Hydro-Electric Division at Netherton. Under the project a gravity and rock-filled dam is to be built at Markham Ferry. As well as providing a measure of flood control, the new power station will supply 100 MW to the State of Oklahoma. It is planned to have the dam completed and the power house in operation by May, 1964.

GHANA

Discussions on Aid

The question of whether the United States will participate in Ghana's Volta River power project is expected to be quickly answered soon after the completion of the current discussions in Accra between representatives of both governments. For some weeks there have been doubts about the US participation in view of President Nkrumah's recent statements. Earlier, it was suggested that America might provide about £47½ million towards the £70 million needed for the development of the power project, and a further £34·3 million of the £45 million cost of the associated aluminium smelter scheme.

INDIA

Export Aim

With production of transformers, switchgear, etc., at the Heavy Electricals factory at Bhopal beginning to flow out steadily after the opening last July, plans are being examined for the advancement envisaged. It has been decided to earmark at least 10% of output of switchgear and transformers from 1963 onwards and export markets are being explored in Ceylon, Burma, Pakistan, Cambodia, Thailand and Indonesia.

PAKISTAN

Village Electrification

The West Pakistan Village Electrification Project has been sanctioned by the Ministry of Fuel, Power and Natural Resources. The project, estimated to cost Rs32·5 crore, including Rs26 crore for foreign exchange, is to be executed within a period of five years. Up to 156 villages in the southern zone with a population of 1,000 or more are to be electrified in addition to those already proposed to be connected up by the WAPDA under the normal expansion of power distribution in West Pakistan.

AUSTRALIA

Victoria's Standard Voltage

The standard voltage for normal retail supply to electricity consumers in Victoria, Australia, in all areas served by the State supply system is to be raised from 230 V to 240 V. This has been decided by the State Electricity Commission and the metropolitan bulk supply authorities to accord with the specification for standard voltages and frequencies recently issued by the Standards Association of Australia. It will, however, take some time for the electricity distribution system throughout the State network to be adjusted for the higher voltage supply. The State Electricity Commission has advised electrical manufacturers of the decision in order that they may make any alterations necessary in their designs. The change will make the standard voltage in Victoria the same as all other States in Australia, except Western Australia, which has 250 V.

Cable for Adelaide

The Electricity Trust of South Australia has placed an order with British Insulated Callender's Cables Ltd. for the supply and installation of some 4,625 yd of 66 kV corrugated seamless aluminium cables in the Adelaide area. These are to be of 0·75 sq in. single-cored, oil-filled type, with the aluminium sheaths protected overall with an extruded p.v.c. oversheath. The cables will be buried direct in the ground, running from substations in the city area to the o.h. lines commencing in the parklands which encircle Adelaide. They are to be installed next April.

Looking Ahead

Recently returned to Australia from a visit to Britain and Canada, Prof Baxter, chairman of the Australian Atomic Energy Commission, visualises the time when Australia might be building one or even two nuclear power stations every two or three years. South Australia was the logical place to build them initially because of its limited supply of coal. The State Government would soon have to decide on whether to import coal from other States or build nuclear power stations, he said.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

2 Nov.—Wallasey C.B.C. Supply of electrical engineering laboratory equipment for Technical College. Director of Education, Town Hall.

3 Nov.—Bognor Regis U.D.C. Supply and erection of Group "A" and "B" lighting, on fixed-price basis, comprising 196 "Stanton" columns and "G.E.C." lanterns, together with the removal of redundant installations. —See 12 Oct. issue.

3 Nov.—Matlock U.D.C. Provision and erection of 28 Group "A" 140 W sodium lighting on steel columns.—Advertised 12 Oct. issue.

3 Nov.—Notts C.C. Provision and erection of illuminated motorway type traffic signs along six miles A1.—See 12 Oct. issue.

3 Nov.—Peterborough J.E.B. Electrical installations in Wittering County Primary School and Walton Secondary Modern School. Applications to Chief Education Officer: L. Tait, Town Hall, by above date.

3 Nov.—Watford B.C. Supply and erection of 52 concrete columns/sodium lanterns along Colne Way-North Western Ave. Borough Engineer and Surveyor: F. C. Sage, Town Hall. Deposit £2 2s.

3 Nov.—Worksop B.C. Wiring, etc., in 137 bungalows. Borough Engineer, Park Hse.

4 Nov.—Cork C.C. Supply and installation of duplicate pumps for 4,000 g.p.h. at 234 ft head at Dripsey. Plant to be complete with motors, switchgear, pipework and valves; and the pumphouse to be wired for power, light and heat.—See 26 Oct. issue.

6 Nov.—Clowne P.C. Supply of (1) 115 25 ft tubular steel columns/brackets; (2) 115 140 W sodium Group "A" lanterns; (3) 115 140 W sodium lamps. Erection of columns.—Advertised 28 Sept. issue.

6 Nov.—Durham C.C. Ten electrically operated diesel delivery pumps.—See 19 Oct. issue.

6 Nov.—East Riding C.C. Installation of electrical services at proposed Norton County Secondary School and proposed Norton home for aged persons—See 19 Oct. issue.

6 Nov.—Fylde Water Board. Supply and installation of electrically driven sludge stirring mechanism, 30 ft dia, for Stoks Filtration Plant, Slaidburn.—See 19 Oct. issue.

6 Nov.—Newtownabbey U.D.C. 250 Group "B" fluorescent lanterns/lamps/control gear/concrete columns.—See 5 Oct. issue.

6 Nov.—Rawtenstall B.C. (a) Supply and installation of lighting fittings and (b) installation only of lighting fittings in Central Library. Borough Engineer and Surveyor, Town Hall.

7 Nov.—Dun Laoghaire B.C. Supply of steel lighting columns for Bray Rd, Loughlinstown, lighting. Town Clerk, Town Hall.

8 Nov.—Durham C.C. Water heating installation in Sacriston County School and electrical installation in Bowes Museum, Barnard Castle. Applications to County Architect, South St, Durham, by above date.

8 Nov.—Sedbergh R.D.C. Erection of master aerial for TV system, provision of amplifiers and installation of distribution cable to 220 council houses.—See 19 Oct. issue.

8 Nov.—Yorkshire E.B. Supply of distribution transformers.—See 12 Oct. issue.

10 Nov.—Bournemouth C.B.C. Supply of: (1) 20 slow signs complete with lighting unit; (2a) 100 lighting units for existing signs; (2b) switchgear boxes for existing signs. Town Clerk: A Lindsay Clegg.

10 Nov.—Down C.C. Electrical installation in Divisional Office and Clinic extension, Pound La, Downpatrick.—See 26 Oct. issue.

10 Nov.—Ennerdale R.D.C. Supply and erection of 22 concrete columns with mercury lighting along A595. Engineer and Surveyor, Council Chmbrs, Cleater.

10 Nov.—N.I. Housing Trust. Electrical installations in (a) 37 dwellings and one shop at Londonderry and (b) 89 dwellings at Newcastle. Trust Offices, 12 Hope St, Belfast.

11 Nov.—Batley B.C. Supply of: 21 reinforced concrete columns; sodium lanterns/lamps/gear; solar dial time switches for trunk road lighting. Borough Engineer and Surveyor, Hanover St.

11 Nov.—East Anglian Hospital Board. Applications for inclusion in select list for engineering services to the Board's Engineer, Anstey Hall, Trumpington, Cambridge, by above date.—Advertised in this issue.

12 Nov.—Sunderland C.B.C. £45,000 electrical installation in Technical College, South Johnson St.—Advertised 19 Oct. issue.

13 Nov.—Holywood U.D.C. Electrical installation in proposed sports pavilion, Seapark recreation grounds.—See 26 Oct. issue.

13 Nov.—Hornchurch U.D.C. (1) Supply of 275 g.p.m. sewage pumping plant, motors and gear for Parsonage Rd pumping station. —See 26 Oct. issue.

13 Nov.—Strabane R.D.C. Supply and installation of 60 g.p.m. at 25 ft head sewage pump.—See 26 Oct. issue.

14 Nov.—Enniskillen. Electrical installation in new kitchen at R.U.C. Depot for Ministry of Finance. Room 103, Law Courts Bldg, Belfast 1.

14 Nov.—Loughborough B.C. Provision and erection of 13 Group "A" steel columns with 400 W mercury lighting.—See 26 Oct. issue.

17 Nov.—Bristol C.C. Fire alarm system installation at 100 Fishponds Rd. City Engineer and Planning Officer, Cabot Hse, Deanery Rd. N.I.C. firms only.

20 Nov.—Forth Rd Bridge J.B. Supply/installation/connecting up of 192 200 W and 140 W sodium lamps on 35 ft and 25 ft steel columns, together with special lighting and illuminated bollards for approach roads lighting. Details from consulting engineers: Mott, Hay and Anderson, 9 Iddesleigh Hse, Caxton St, S.W.1.

20 Nov.—Manchester C.C. Contracts 326A, B and C. Communal TV distribution installations in 575 maisonnettes and flats, Miles Platting. Director of Housing, Town Hall.—Advertised in this issue.

20 Nov.—West Cumberland Water Board. Supply and installation of 1,500 g.p.m. at 75 ft head pumps complete with starter, control gear, metering, valves and pipework at Low Liza Bridge, Lorton. Clerk: F. Clapham, Stoneleigh, Park End Rd, Workington.

20 Nov.—West Riding C.C. Conversion of Thorne Swing Bridge on A614 to power operation. County Engineer and Surveyor, County Hall, Wakefield. Deposit £5.

21 Nov.—Ministry of Transport. Supply of steel lighting columns, traffic bollards and subway lighting and for cabling and installation work along Heads of the Valleys Rd (Section 1—Brynmawr to Abergavenny). Applications to Engineer for the Work, Rendel Palmer and Tritton, 125 Victoria St, S.W.1, by above date.

22 Nov.—Godstone R.D.C. Installation of two 5 in. dia. submersible pumps/10 h.p. motors and 200 yd asbestos-cement rising main. Engineer and Surveyor, Council Offices, Oxted. Deposit £2 2s.

23 Nov.—Down C.C. Electrical installation in Bangor Girls (new) Grammar School. Details from consulting engineers: McAuslan and Ptnrs., 16 Bedford St, Belfast 1. Deposit £5 5s.

24 Nov.—Hereford C.C. Electrical installations in 74 houses No. 6 site and 72 houses No. 7 site, Newton Farm.—Advertised 26 Oct. issue.

27 Nov.—Worksop B.C. Scheme involving 217 60 W sodium lighting on 15 ft concrete columns: (1) Supply of lanterns/lamps/gear; (2) Removal of existing lighting and supply of columns together with wiring and fitting of equipment; (3) Whole of work. Borough Engineer, Park Hse. Deposit £3 3s.—Advertised in this issue.

28 Nov.—Dartford B.C. Supply and erection of 15 15 ft steel columns and mercury lamps/lanterns on Temple Hill (Site 2c). Town Clerk: T. Armstrong, Council Offices. Deposit £2 2s.

28 Nov.—Dartford B.C. Supply and erection of 26 25 ft reinforced concrete columns and 400 W MBF/U lamps/lanterns along Watling St, Stone Parish Council. Town Clerk: T. Armstrong, Council Offices. Deposit £2 2s.

2 Dec.—Kilkenny C.C. One 1,000 g.p.h. submersible pump.—See 26 Oct. issue.

18 Dec.—E.B. for N.I. Specification 1642. Supply and erection of lighting and heating associated with No. 4 boiler and turbo-generator at Coolkeeragh. Applications to consulting engineers: Kennedy and Donkin, 64 Royal Exchange, Manchester 2, by 13 Nov. Deposit £5, made payable to E.B. for N.I.

18 Dec.—Southampton C.B.C. Electrical installation in College of Technology. Applications to Borough Architect, Civic Centre, by 18 Nov.—Advertised in this issue.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 114 queries answered this week

"Elmatic" elements—makers of? S.E.E.B.—Elmatic, Colchester Estate, Colchester Ave, Cardiff.

"Mysto" fires—makers of? E.D.—Bescol (Electric) Ltd., 118 Parkfield Rd, Saltley, Birmingham 8.

"Baume" clocks—suppliers of? E.E.W.—Baume and Co. Ltd., 1 Hatton Gdn, E.C.1.

"Haden" heating elements—address for? S.E.E.B.—D. H. Haden Ltd., 4 Lancaster St, Birmingham 4.

"Hanaulux" operating theatre lighting—agents for? E.H.R.—Sierex Ltd., 15 Clipstone St, W.1.

"Beacon" generators—makers of? S.C.A.T.S.—Workman Reed and Co. Ltd., Beacon Wks, Hewish, Bristol, Som.

"Giusti" pastry roller—address for? S.W.E.B.—T. Giusti and Son Ltd., 210 York Way, N.7.

"Ferrowatt" lamps—makers of? F.R.—Northern Steel and Hardware Co. (Glasgow) Ltd., 4 Stockwell Pl, Glasgow C.1.

"Sector" vacuum cleaners—suppliers of? P.E.S.—Electric Components Ltd., Components Hse, Ludgate Hill, Birmingham 3.

"Lindapter" girder clips—makers of? T.E.—Henry Lindsay Ltd., P.O. Box No. 97, Mansfield Rd, Bradford 8, Yorks.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

7 Nov.—Argentina. Copper conductors on concrete columns, insulators, steel cables, for 89 million pesos transmission line. Avenida General Paz 374, Piso 1, Cordoba. B.o.T. (ESB/33703/61).*

8 Nov.—Ceylon. Sound level meter, voltmeters, oscillators, auto-transformers, resistance units, capacitors and oscilloscopes (46 items). Co-ordinator of Foreign Programmes, Texas Agricultural and Mechanical College, College Station, Texas, U.S.A. B.o.T. (ESB/33458/61/ICA).*

12 Nov.—Iraq. 100 multi-colour underwater floodlights. Director-General, Iraqi Ports Administration, Margil. B.o.T. (ESB/33439/61.)*

12 Nov.—Kuwait. 40 street lighting feeder pillars. President, Dept. of Electricity, Water and Gas. B.o.T. (ESB/33469/61).*

14 Nov.—Singapore. Service fuse boxes and neutral connectors. City Council, Electricity Dept. B.o.T. (ESB/33758/61).*

15 Nov.—Kuwait. Street and floodlighting equipment (15 items). President, Dept. of Electricity, Water and Gas. B.o.T. (ESB/33743/61).*

20 Nov.—India. Requirements of Atomic Energy Establishment, Trombay, Purchase Division, Mohatta Bldg, Palton Rd, Bombay 1: 20 Nov.—Ultrasonic flaw detector, B.o.T. (ESB/33404/61)*; 22 Nov.—Centreless grinding machine, B.o.T. (ESB/33406/61)*; 23 Nov.—Surface grinder for ceramic fuel elements, B.o.T. (ESB/33407/61)*; 21 Nov.—Vacuum dewaxing furnace, B.o.T. (ESB/30790/61).*

20 Nov.—India. Tender Inquiry HCP/SVHEP-10/Sept., 1961. Transformer oil filtering sets, vacuum pumps, heating pads and oil testing transformers for Sharavathi Valley H.E. Project. Engineer, H.E. Construction Projects, P.B. 60, Bangalore 1. Details, fee £1 17s 6d, from Co-ordinating Branch, India Store Dept., Bromyard Ave, W.3. Viewing reference S.353/61/NSC/ENG.2.

21 Nov.—Singapore. 1·1 kV and 22 kV cable; 200 chokes for h.p.m.v. lamps. City Council, Electricity Dept.. B.o.T. (ESB/33489 and 33759/61).*

22 Nov.—Uruguay. Measuring equipment (18 items). La Escribania da la Administracion General de las Usinas Electricas y los Telefonos del Estado. B.o.T. (ESB/33166/61).*

24 Nov.—Iraq. "Electric sets" for Kermat Bani Saeed, Baiji, Kwair and Kadissiyah. Secretary of the Purchases and Tenders Committee in Ministry of Municipalities. B.o.T. (ESB/33448/61).*

24 Nov.—New Zealand. One 11 kV switchboard and four 11 kV ring main units. Town Clerk, Hamilton C.C., P.O. Box 937. B.o.T. (ESB/33459/61).*

28 Nov.—America. Generator voltage bus structure, l.v. feeder busways and switchgear for Spring Creek Power Plant. Dept. of the Interior, Bureau of Reclamation, Bldg 53, Denver Federal Center. B.o.T. (ESB/33733/61).*

28 Nov.—Pakistan. 2,500 lb tinned copper fuse wire and 300 lb lead fuse wire for W.A.P.D.A. R. E. B. Wilcox and Co., 36 Gt St. Helens, E.C.3, are representatives. B.o.T. (ESB/33473/61).*

29 Nov.—Pakistan. Indoor 11 kV cable boxes (six items). R. E. B. Wilcox and Co., 36 Gt St. Helens, E.C.3, are representatives. B.o.T. (ESB/33472/61).*

29 Nov.—Uruguay. Equipment for controlling combustion, etc., for eight steam generators. La Escribania de la Administracion General da las Usinas Electricas y los Telefonos del Estado. B.o.T. (ESB/33167/61).*

2 Dec.—India. Aluminium conductors: 20 mile 7/·1093; 20 mile 7/·0975; 60 mile 7/·0772 and 85 mile 7/·1548 plus accessories. Singareni Collieries Co. Ltd., Kothagudium Collieries P.O., Bhadrachellam Rd Station, Central Railway, Deccan. B.o.T. (ESB/33465/61).*

5 Dec.—Egypt. 63 kV oil-filled cables, pilot and telephone cables and accessories. Director-General, Cairo Electricity and Gas Administration, 53 Ave 26 July, Cairo. B.o.T. (ESB/33133/61).*

12 Dec.—Australia. Two pumping units. Metropolitan Water, Sewerage and Drainage Board, Sydney, N.S.W. B.o.T. (ESB/33147/61).*

CONTRACTS PLACED

Brierley Hill U.D.C. Electrical services in Assembly Hall (Phase III) at Civic Bldgs, Williams Bros. Ltd., £3,953.

Chatham B.C. Gas street lighting conversion scheme, Eleco Ltd., £75,335. Recommended.

Enniskillen R.D.C. Provision of 159 fluorescent lighting units for villages, A.E.I. Lamp and Lighting Co. Ltd., £4,050.

Isle of Ely C.C. Rewiring, etc., of Wisbech Grammar School, G. Howard, £720.

L.C.C. Provision of water heaters in 405 dwellings on Becontree estate, F. J. Baynes and Co. Ltd., £22,090.

Manchester C.C. Lift installation in Heywood View Aged Persons' Home, N. Breakell and Co. (Blackburn) Ltd., £1,640.

Middlesex C.C. Lighting of Wraysbury roundabout on Staines By-pass, Atlas Lighting Ltd., £3,003. Recommended.

Orrell U.D.C. Supply and erection of 44 Group "B" columns complete with 80 W mercury lanterns, Abacus Municipal Ltd.

Ripon C.C. Supply and erection of 24 Class "A" columns and 103 Class "B" columns together with lighting fittings, A.E.I. Lamp and Lighting Co. Ltd., £5,310. Recommended.

Rochdale B.C. Rewiring work at Oakenrod Primary School, Simmons Electrical Contracting Co., £1,812.

St. Pancras B.C. Electrical installation, £4,578, T. H. Smerdon Ltd.; and lift installation, £5,444, Express Lift Co. Ltd., in Ferdinand St housing scheme.

Tottenham B.C. Supply and erection of 25 ft concrete columns, Concrete Utilities Ltd., £1,573; and the supply of 140 W sodium lanterns, Atlas Lighting Ltd., £300, being Stage VIII of street lighting scheme. Stage IX: supply and erection of Group "B" concrete columns, Concrete Utilities Ltd., £10,191; supply of 60 W sodium lanterns, Phosco Ltd., £4,564; supply of control gear, Philips Electrical Ltd., £3,215. Recommended.

Wortley R.D.C. Extension of Group "A" mercury lighting along Burncross and Hallwood roads, A.E.I. Ltd.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Aerialite Popular. 821,919. Class 11. Cabinets for drying clothes. Aerialite Ltd., Castle Wks, Stalybridge, Ches.

BW. 782,110 and in design 782,112. Class 7. Bottle washing machines, etc, 782,111 and 782,113. Class 11. Inspection light apparatus, etc. Barry-Wehmiller Machinery Co. Ltd., Wingate Hse, 93-107 Shaftesbury Ave, W.1.

El-stat. 809,865. Class 9. High voltage apparatus for the control of electrostatic charges used in flocking processes. Allen Maintenance (Industrial Electronics), 174 Oxford Rd, Manchester 13.

Filtromat. 796,270. Class 11. Coffee making apparatus, etc. Wurttembergische Metallwarenfabrik, Geislingen (Steige), Germany.

Frigeco. 819,230. Class 9. Apparatus, etc. 819,231. Class 11. Refrigerators, etc. Frigeco S.A., 67-75 Quai President Paul Doumer, Courbevoie (Seine), France.

FW in design. 780,832. Class 11. Steam generating installations, etc. Foster Wheeler Ltd., 3 Ixworth Pl, S.W.3.

Hydrojet. 781,519. Class 11. Installations utilising flowing water for the conveyance of ash, etc. Babcock and Wilcox Ltd., 209-225 Euston Rd, N.W.1.

Konaxal. 814,163. Class 9. Cable couplings and junction boxes. Kay and Co. (Engrs.) Ltd., Bolton Brass Wks, Blackhorse St, Bolton, Lancs.

Lexsam. 817,142. Class 11. Catering and cooking appliances, etc. Kitchen Supplies Ltd., Lexington Hse, 12-26 Lexington St, W.1.

Mabelec. 820,918. Class 11. Lighting apparatus etc. Manufacture Belge de Lampes et de Materiel Electronique, 80 Rue des Deux Gares, Brussels 7, Belgium.

Minirediff and **Rediff.** 819,143 and 4. Class 9. Remote indicating differential pressure gauges. Appleby and Ireland Ltd., Mark La, Basingstoke, Hants.

Prox and **Proxamat.** 820,481 and 2. Class 9. Burglar and fire alarms, etc. Burgot Alarms Ltd., 26 Westbourne Grove, W.2.

Spirap. 823,080. Class 17. Insulating materials. Amp Inc., Eisenhower Boulevard, Harrisburg, Pennsylvania, U.S.A.

Vimare. 818,914. Class 7. Motors, etc. British Manufacture and Research Co. Ltd., Springfield Rd, Grantham, Lincs.

TRADE NOTES

Changes of address. As from 1 Jan., 1962, the sales office of Microwave Instruments Ltd. will be transferred from North Shields to 98 St. Pancras Way, N.W.1.

The Commercial and Administrative Departments of the Semiconductor Division of the General Electric Co. Ltd. are now at Broadstone Wks, Broadstone Rd, Reddish, Stockport. Telephone: Heaton Moor 6351.

The South Eastern Regional standards engineers' office of the C.E.G.B. at Kingston is moving as from 6 Nov. to Generation Hse, P.O. Box 136, 160a-170a Gt. Portland St, W.1.

Hagan Controls Ltd. have this week moved to Weedon Rd, Northampton. Telephone: Northampton 260.

Change of telephone nos. Brook Motors Ltd. announce that the new telephone no. of the Glasgow office is Central 5667.

The telephone no. of Hellermann Ltd. and Bowthorpe Electric Co. has been changed to Crawley 28888.

Expansion. £350,000 extensions at the Waltham Cross works of Murex Welding Processes Ltd., just completed, consist of a 500 ft long production shop for the manufacture of electric arc welding plant, and a two-storey office block.

The Cambridge Instrument Co's new instrument assembly wing was officially opened last week by Sir Keith Joseph, Minister of State, Board of Trade.

Agents. Siemens and Halske A.G., West Germany, have appointed Walmore Electronics Ltd., 11-15 Betterton St, W.C.2, as their U.K. representatives for special electronic valves.

Distributors. Associated European Sales (Gt. Britain) Ltd., 6 Bloomsbury Sq, W.C.1, seek wholesale distributors prepared to purchase, on a c.i.f. basis, for the South African "Archer" fan heater.

BUSINESS PROSPECTS

Aberdeen. Bowling centre planned, Sea Beach. Architects: T. Scott Sutherland and Ptnrs., Waverley Hse, Waverley Pl.

Acton. Planned: new factory, Stirling, for Fred Townend and Co. Ltd., Bollo La, Acton, W.3.

Barking. New offices at cost of £250,000 proposed for W. Warne and Co. Ltd., indiarubber works, Barking. Architects: Higgins and Thomerson, 90 Romford Rd, E.15.

Basildon. New premises to cost £150,000 planned for Gilbarco Ltd., Park Way, N.W.1. Architects: J. R. Harris, 38 Queen Anne St, W.1.

Bedford. Elliott, Cox and Ptnrs., 172 Buckingham Palace Rd, S.W.1, architects for large extensions proposed at Ampthill Rd Works of W. H. A. Robertson Ltd.

Belfast. New Halls of Residence are planned for Queen's University. Consultants for first phase, W. H. Stephens and Sons, 13 Donegall Sq North, Belfast.

Billericay. Contract at £230,000 placed for factory/offices for John Tann Ltd., Newgate St, E.C.1. Contractors: Ronald Lyon Construction Ltd., Auckland Hse, Walton-on-Thames.

Birmingham. C.C. recommended to accept £373,159 tender of Heenan and Froude Ltd., Worcester, for plant and chimney at new refuse disposal works, Castle Bromwich. Tender: police training college, Pershore Rd, Edgbaston; City Architect. Tender: 80 two-storey dwellings, Rilstone Rd, Harborne; City Architect.

Bishop Auckland. G. Stephenson Ltd., Holdforth Mill, contractors for shops/offices, Newgate St.

Blackpool. Capital and Commercial Investments Ltd., propose development of five acres of the Cleveleys Hydro site.

Bournemouth. B.C. plan 40-bed home, Pucks Dell, to cost £70,500, and home for 40 men and 40 women. Cost: £110,000.

Bradford C.C. Tender: single-storey garage including electrically heated r.c. floor; City Engineer.

Brentwood. T. P. Bennett and Son, 43 Bloomsbury Sq, W.C.1, architects for large block of offices proposed by Ford Motor Co. Ltd.

Bridge Blean R.D.C. Tender: 20 dwellings, Fleets La, Hackington; architect: H. V. Godfrey, 63 Oxford St, Whitstable.

Bridlington. Hardy and Co., Chapel St, propose 22 bungalows, Harewood Ave. B.C. propose 30 bungalows, West Hill estate; Engineer.

Burton Latimer. B. A. Evans, Burton Latimer, Northants, propose 140 dwellings, Finedon Rd area, together with shops.

Cardiff. N.C.B. propose eight-storey office block as extension of Divisional H.Q., Ty-Glas Ave. Proposed by Wales Television Ltd., to develop Mill House site, Western Ave, for TV studios and offices.

Chester C.C. Tender: Macclesfield College of Further Education; cost: approx. £110,000; County Architect, Chester.

Chester-le-Street. Broughs Ltd., Oxford St, Newcastle, propose shops/coffee bar/warehouse, Front St; architects: A. K. Tasker and Ptnrs., 25 New Bridge St, Newcastle.

Derby. Sheffield Regional Hospital Board appointed T. H. Thorpe and Ptnrs., 41 Friar Gate, Derby, architects for dental unit and occupational therapy department, Kingsway Hospital.

Doncaster. B.C. propose new Hyde Park secondary school; Architect.

Easington. Peterlee D.C., Shotton Hall, Castle Eden, propose 359 dwellings, Chapel Hill.

Exeter. Mutley Properties Ltd., 6 Mount Pleasant Terr, Plymouth, propose industrial premises, Trusham Rd.

Folkestone. Proposed factory near Biggins Wood Rd, for F. W. Maul and Son, 78 Tontine St.

Gateshead. Proposed: shopping centre of 50 shops, High St/Ellison St for E. Alec Colman Group, 5 Hyde Pk Gate, S.W.7. Planned: shops and a super-market, High St for Charterbridge Group. Architects: Ardin and Brookes, 6 Cavendish Pl, W.1.

Gillingham B.C. Tender: 76 dwellings, Wakeley Rd, Rainham; Engineer.

Glamorgan. Tenders for first stage of conversion of St. Donat's Castle into Atlantic College. Architects, Sir Percy Thomas and Son, 10 Cathedral Rd, Cardiff.

Glasgow. Proposed £225,000 new Hall of Residence for University of Glasgow, Garscube estate. Architects: Grenfell Baines and Hargreaves, Guildhall St, Preston.

Gosforth. Proposed: conversion of Oakfield Hse to independent girls' school at cost of £103,000; architects: Mauchlin, Weightman and Elphick, Saville Row, Newcastle.

Halifax. Contract is placed for factory/administration block for John Mackintosh and Sons Ltd. Contractors: Higgs and Hill Ltd., 33 St. Paul's St, Leeds 1. Cost: £820,000.

Hemel Hempstead. D.C. plan shops and offices to cost £200,000. Quantity surveyors: A. E. Seaden, 51 Cannon St, E.C.4.

Hereford. Contract worth £419,000 placed with R. M. Douglas (Contractors) Ltd., 395 George Rd, Birmingham 23, for stage three of new wire mill for Henry Wiggin and Co. Ltd.

Holland. C.C. propose £121,000 phase of new College of Further Education, Boston; County Architect, Boston.

Houghton-le-Spring. W. Leech Ltd., St. James St, Newcastle, propose 300 dwellings with shops, Shiney Row.

Kent. Proposed: £200,000 machine house and effluent treatment plant, Chartham Paper Mill, for Wiggins, Teape Ltd. Contractors: Richard Costain (Construction) Ltd., Westminster Bridge Rd, S.E.1.

Leeds. Regional Hospital Board. Tender: alterations and extensions, Lloyd Hospital, Bridlington; architects: Mortimer Ptnrs., Ainderby Hall, Northallerton. C.C. Tenders: total of 445 dwellings, various sites; City Architect.

London, E. A factory and warehouse, etc., are planned at Mansell St and Prescot St, E.1. Architects: Gordon and Gordon, Finsbury Hse, Blomfield St, E.C.2. Extensions are proposed for Marsh Vick and Co. Ltd., Dulcia Mills, Herbert St, E.13. A factory and offices proposed at 1 to 4 Park La, E.15, for Bowden Engineering Ltd., of that address. Cost £35,000. Architects: Oxley and Burgess, 1 Como St, Romford, Essex. Proposed warehouse for House of Selincourt, W.1. Contractors: Ronald Lyon Construction Ltd., Auckland Hse, Walton-on-Thames. Cost: £117,000. Factory, Coronation Rd, Acton, W.3, proposed for Central Way Properties Ltd. Plans by Allnatt (London) Ltd., 23 Park Royal Rd, N.W.10. Lister Institute for Preventive Medicine to be erected, Chelsea Bridge Rd. Cost: £60,000. Architects: Lanchester and Lodge, 10 Woburn Sq, W.C.1. Proposed: a biological science department, Half Moon La, S.E.3, for Kings College. Architects: Troup and Steel, 14 Grays Inn Sq, W.C.1. Planned: R.C. secondary school, Footscray Rd, Eltham, S.E., to cost £221,200. Proposed headquarters, St. Marylebone, for Royal College of Physicians, to cost £750,000. Quantity surveyors, Widnell and Trollope, Broadway Ct, Westminster, S.W.1. Seven shops, 21 flats proposed, 743 Sidcup Rd, S.E.10. Architects: Hildebrand and Glicker, 34 London Wall, E.C.2. British Oil Corporation proposes offices/houses, Camberwell Grv, S.E.5. Architects: A. Kenyon, Taute and Ptnrs., 140 Park La, W.1. Kingsmere Investment Co. Ltd. placed contract with Myton Ltd., Western Ave, W.5, for showrooms/offices/flats, Arlington St, S.W.1. Brewers Society propose offices/flats, Portman Sq, W.1. Cost: £250,000. Architect: J. E. Ralph, 1 Gower St, W.C.1. Proposed: shopping centre and a ten-storey office block Elephant and Castle Shopping Centre, for W. Willett Ltd., Sloane Sq, S.W.1.

Loughborough. B.C. propose 90 dwellings; Surveyor.

Maidstone B.C. Tender: 58 dwellings, Park Wood estate; Engineer.

Manchester. Tenders: Regional Hospital Board, Cheetwood Rd, propose five-storey ward block; two-storey pathological lab./workshops block; two-storey operating theatre and structural adaptations to buildings, Blackburn Royal Infirmary. Cost: £650,000. Also four-storey maternity unit, Hope Hospital, Salford. Regional Architect.

Margate. Bernard Sunley Investment Trust (Margate) Ltd., Berkeley Sq, W.1, propose development scheme, Casino site. Plans provide for 51 shops and 136 flats in 17-storey block.

Middlesbrough. B.C. propose £64,000 old people's hostel, Pallister Park; Engineer.

Mitcham B.C. Tender: 245 dwellings, Phipps Bridge redevelopment; Engineer.

Newcastle. Offices, Portland Terr, proposed for Midland Employers Mutual Assurance Co. Ltd., Northumberland St. Architect: R. Turley, 42 Jesmond Rd.

North Riding. Thomas Mellor, Church Wood, Church Rd, Lytham St. Annes, appointed architect, by C.C. for proposed Guisborough Primary School. Gelder and Kitchen, 120 Alfred Gelder St, Hull, appointed architects by C.C. for proposed Grangetown County Primary School.

N. Ireland. Proposed by N.I. Ministry of Commerce, a factory for J. Scott and Co. Ltd., Main St, Castlederg.

Nottingham. Bank and offices, Canning Circus, proposed, Prudential Assurance Co. Ltd., Holborn Bars, E.C.1.

Oxford. Governors of St. Hilda's College propose a residential block, Cowley Pl. Architects: Richardson and Houfe, 24 Queen Anne St, W.1. Plans for phase one of nuclear physics department, Keble Rd Triangle, for University of Oxford Chest.

Rochdale. Tender: All Saints' C.E. Primary School, Foxhole Rd; architects: Design Partnership, 58 Topling St, Blackpool.

Rochester C.C. Tender: 79 dwellings, Earl estate; City Surveyor.

Southampton C.B.C. Tender: total of 31 traditional houses and two blocks of five-storey flats, various sites; Borough Engineer.

Stockton. B.C. propose new girls' modern school, Hardwick; Architect.

Stratford-on-Avon. The Trustees of Shakespeare's Birthplace propose new £100,000 Shakespeare centre, to include library/administrative h.q. and study centre. Higgs and Hill Ltd., of Coventry, main contractors.

Sunderland. Newcastle Regional Hospital Board, Benfield Rd, Newcastle, propose two operating theatres, Ryhope General Hospital; chief architect: P. H. Knighton. B.C. propose Bishop Harland C.E. School, Hylton Red Hse estate; architects: P. R. Middleton and Ptnrs., 111 Albert Rd, Middlesbrough.

Sutton Coldfield. Planned: factory, site 8, Reddicap estate for W. E. Lawley, Sutton Coldfield.

Tyldesley U.D.C. Tender: new swimming baths including heating plant; Engineer.

Tynemouth. Proposed: eight acres, New York Rd, N. Shields for industrial purposes. M. J. Liddell and Sons Ltd., building contractors, 36 Great North Rd, Newcastle. B.C. award contract for school for subnormal children to A. R. Robertson Ltd., East Park View, Blyth.

Warrington. New factory, Grappenhall, proposed by Metro-Cutanit Ltd., Allen St. Architects: J. W. Beaumont and Sons, 51 Mosley St, Liverpool 2.

Wimbledon. Supermarket, cost £250,000, proposed for John Gardner (London) Ltd., Bridge Hse, London Bridge, S.E.1.

Workington. Proposed: new casualty department, Workington Infirmary, for Newcastle Regional Hospital Board. Board Architect.

Yeovil. City and Town Bldgs Ltd., Shaftesbury Ave, W.C.2, propose redevelopment in Middle St.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

A and E Electrical (Manchester) Ltd., 1149 Rochdale Rd, Manchester 9. Nom. cap.: £100. Dirs.: Wm. Albiston and Frank Entwistle.

Abacus Electronics Ltd. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: N. Pollard, 27 Dorset Ave, Welling, Kent; and A. S. Cannings, 3 Pump Court, E.C.4.

Chevina Electrics Ltd., 713 Imperial Hse, Kingsway, W.C.2. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: Shirley Hart and Averill Hart.

P. J. Colton Ltd. Electrical engineers and contractors, etc. Nom. cap.: £1,000. Dirs.: Peter J. Colton, 10 Maple Grove, Breaston, Derbys; and Albert E. Flux, 1 Glebe Rise, Littleover, Derby.

Digital Measurements Ltd. Manufacturers of and dealers in measuring, indicating, recording and controlling instruments of all kinds, etc. Nom. cap.: £80,000. Dirs. not named. Subs.: Jeremy P. Raisman and George Conrad, 11 Old Jewry, E.C.2.

Elcom (Northampton) Ltd. Manufacturers of and dealers in electronic components, etc. Nom. cap.: £25,000. Dir.: Walter S. Cator, "Brooklyn," Kettering Rd, Northampton. Subs.: Walter S. Cator and Mrs Doris A. Cator.

Electrad Central Heating Co. Ltd., 225 Oxford St, W.1. Nom. cap.: £1,000. Dirs.: Robert J. Palmer and George J. Davidson.

Electrical Service (Wembley) Ltd. Electrical, radio and television engineers, etc. Nom. cap.: £200. Dirs.: Gordon P. B. Ballard and Jean L. Ballard. Subs.: George A. Crook and Valerie J. Crook, 51 Caversham Ave, N.13.

Geejay Products (Birmingham) Ltd., 164-174 Corporation St, Birmingham 4. Manufacturers and factors of automobile and electronic components, etc. Nom. cap.: £1,000. Dirs.: Joseph E. T. Weaver and George W. Sample.

W. Greenwood Electronic Ltd., 677 Finchley Rd, N.W.2. Manufacturers of and dealers in electrical and electronic instruments, etc. Nom. cap.: £100. Dirs.: Walter J. Greenwood and Agnes Greenwood. Subs.: John Ullman and Frances Ullman.

Griffin Engineering Products Ltd., 246 Ballards La, N.12. Manufacturers of and dealers in rubber, electrical equipment specialists, etc. Nom. cap.: £100. Dirs.: Patrick P. Griffin and Kenneth J. Hampton.

Halford and Son Ltd., 60 Woodland Ave, Shenfield. Electricians, etc. Nom. cap.: £1,000. Dirs. not named. Subs.: Mrs Edna K. Halford and Harry E. J. Halford.

Hambro Electronics Ltd., 6 Gate St, W.C.2. Nom. cap.: £500. Dirs.: Eugene E. Ashley and Kenneth A. Brewer.

Henshalls (Buxton) Ltd., 54 Spring Gdns, Buxton, Derbys. Electrical suppliers, etc. Nom. cap.: £100. Dirs.: Russell Henshall and Russell S. Henshall.

Herd and Kidd (Blackpool) Ltd., Erinville, Green Ave, Blackpool. Electrical engineers, etc. Nom. cap.: £500. Dirs.: David Kidd and Doris Kidd.

Mitchel and King (Hldgs) Ltd. To enter into an agreement with Wm. E. Cole, John Staples, Douglas M. Read, Lillian Cole and Cole Investments Ltd. for the acquisition of certain shares in Mitchel and King Ltd.; SFIM (Great Britain) Ltd.; and Isora Illuminating Ceilings Ltd., etc. Nom. cap.: £61,000. Subs.: Antony J. Adler and David M. Blackburn, 15 Wimpole St, W.1.

Needhams Electrical (Loughborough) Ltd., 14 Market St, Loughborough. Leics. Nom. cap.: £100. Dirs. not named. Subs.: Pamela Needham and A. M. Phillipson.

R. E. Parrott and Co. Ltd., 7 King's Rd Trading Estate, Newbury, Berks. To design, develop, manufacture and distribute electronic and electro-magnetic mechanisms and devices, etc. Nom. cap.: £2,000. Dirs.: Robert E. Parrott and Anne M. Parrott.

A. J. Rice (Folkestone Factors) Ltd., 52 Gaisford Close, Worthing. Electrical equipment factors, etc. Nom. cap.: £1,000. Dirs.: Arthur Osborne, Allan Northeast and Evelyn M. R. Osborne.

Shipton Automation (Rentals) Ltd. Letters on hire of electronic and electrical apparatus, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: Stella Allen and Ellen Tindall, Barrington Hse, 59-67 Gresham St, E.C.2.

Sondec Ltd. Electrical, electronic and civil engineers, etc. Nom. cap.: £100. Dirs.: Alan V. Olorenshaw, 1 Little Dover Hse, Dover Park Drive, S.W.16; and Frank E. S. Robinson, 65 Reigate Rd, West Worthing, Sussex.

P. C. Sumner Ltd., 64 High St, Bushey, Herts. Designers and manufacturers of mechanical, structural and electrical machinery, etc. Nom. cap.: £1,000. Permanent dirs.: Philip C. Sumner and Mrs S. M. Sumner.

Willis and Hedges Ltd., 76 Church Rd, Ashford, Middx. Electrical engineers, etc. Nom. cap.: £1,000. Dirs.: John J. Willis, Mrs Mary C. Willis, Frederick A. Hedges and Mrs D. M. Hedges.

MEETINGS TO NOTE

THURSDAY, 2 NOV.

I.E.E. "Acoustics and the Electrical Engineer," T. Somerville. Savoy Pl, W.C.2. 6 p.m.

I.E.E. (N. Midlands). "Blaenau Ffestiniog and other Medium-head Pumped Storage Schemes in Great Britain," H. Headland. Joint meeting with Yorkshire Assoc. of the Inst. of C.E. and Yorkshire branch of the Inst. Mech. Eng. Chemistry Lecture Theatre, Leeds University. 6.30 p.m.

INSTITUTION OF MECHANICAL ENGINEERS (Process Eng., Refrigeration, Ventilation and Vacuum Plant Group). Discussion: "Problems of Maintenance in the Petroleum and Kindred Industries." 1 Birdcage Walk, Westminster, S.W.1. 6 p.m.

FRIDAY, 3 NOV.

I.E.E. (Medical Electronics Discussion Group). Discussion: "Information Theory in Relation to Biology." Savoy Pl, W.C.2. 6 p.m.

I.E.E. (N.E. Graduates and Students). "The Hownsgill Plate Mill—Its Construction and Operation," M. H. Hepworth. Joint meeting with the Graduate and Student Sections of the Institution of Civil Engineers and the Institution of Mechanical Engineers. Grey Hall, King's College, Newcastle upon Tyne. 6.30 p.m.

A.S.E.E. (Liverpool and District). "Current Practice and Recent Trends in Cable Joints and Terminations up to 11 kV," H. Flack. Industrial Development Centre, M.A.N.W.E.B., Paradise St. 7.30 p.m.

A.S.E.E. (Wolverhampton and District). Branch dinner-dance at Woolpack Restaurant, Wolverhampton.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (S. Western Branch). "The Mossbauer Effect," Dr G. Lomer. The University, Exeter. 7 p.m.

IPSWICH AND DISTRICT ELECTRICAL ASSOCIATION. Ladies' Ball at Royal Hotel, Clacton-on-Sea.

SATURDAY, 4 NOV.

I.E.E. (London Graduates and Students). Joint Students' Dance at Carlton Rooms, W.9. 7.30 p.m.

MONDAY, 6 NOV.

I.E.E. (Electronics and Communications Section). "The General Problems of F.M. Multichannel Communications," R. G. Medhurst. Savoy Pl, W.C.2. 5.30 p.m

I.E.E. (E. Anglian). "Are Aircraft Electrics Too Complicated?" H. Zeffert. Joint meeting with the Cambridge branch of the Royal Aeronautical Society at the College of Arts and Technology, Cambridge. 6.30 p.m.

I.E.E. (Mersey and N. Wales). Annual dinner. Grosvenor Hotel, Chester. 6.30 for 7 p.m.

I.E.E. (N.E. Measurement and Electronics Group). "Microminiaturization," L. J. Ward. Rutherford College of Technology, Northumberland Rd, Newcastle upon Tyne. 6.15 p.m.

I.E.E. (S. Midlands). "A Dynamic Model for Studying the Behaviour of the Overhead Equipment Used in Electric Railway Traction," D. S. Farr, H. C. Hall and A. L. Williams. James Watt Memorial Institute, Birmingham. 6.30 p.m.

INSTITUTION OF MECHANICAL ENGINEERS (Manipulative and Mechanical Handling Machinery Group). Discussion: "Port Handling of Cargoes—Are Dockside Cranes Out-moded?" 1 Birdcage Walk, Westminster, S.W.1. 6 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Control Section). "Semiconductor Diodes and Rectifiers in Control Engineering," P. R. Wyman; and "The Transistor in Control Engineering," Dr G. D. Bergman. Manson Hse, 26 Portland Pl, W.1. 6.30 p.m.

E.P.E.A. (London Technical Group). "Modern Power Plants and Operating Practices—Detroit Edison Co., U.S.A.," J. R. Taylor. Tudor Room, Caxton Hall, S.W.1. 6.30 p.m.

A.S.E.E. (Bolton). "Modern Electric Motors and Their Control," J. B. Abbot. The Railway Hotel, Trinity Street, Bolton. 7.45 p.m.

A.S.E.E. (Halifax). "The Activities of the E.I.B.A.," J. R. Bardsley. Griffin Hotel, George St, Halifax. 7.45 p.m.

A.S.E.E. (Leeds). "The Application of Photoelectric Cells," A. C. Stewart. Great Northern Hotel, Leeds. 7.30 p.m.

A.S.E.E. (Sheffield). "Old Sheffield: 1943," Miss M. Walton. Royal Victoria Hotel. 7.30 p.m.

A.S.E.E. (S. Essex). "The Royal Naval Electrical Specialisation," by Capt. B. Bloomfield, R.N., at Angel Hotel Ilford, Broadway, Ilford. 8.15 p.m.

A.S.E.E. (S. Wales). "Silicones in the Electrical Industry," J. Davies. South Wales Institute of Engineers, Park Pl, Cardiff. 7.30 p.m.

TUESDAY, 7 NOV.

I.E.E. (N. Midlands). "Technical and Economical Aspects of the Supply of Reactive Power in England and Wales," W. Casson and H. J. Sheppard. Leeds and County Conservative Club, South Parade, Leeds 1. 6.30 p.m.

I.E.E. (N.E.). "Silicon Power Rectifiers," A. J. Blundell, A. E. Garside, R. G. Hibberd and I. Williams. Workington College of Further Education. 7 p.m.

I.E.E. (N.W. Utilisation Group). "Some Recent Developments in Oscillating Machines," F. C. Williams. Electrical Engineering Laboratories, Manchester University. 6.15 p.m.

I.E.E. (S.E. Scotland). "Brushless Variable-speed Induction Motors Using Phase-shift Control." Prof F. C. Williams, E. R. Laithwaite, J. F. Eastham and W. Farrer. Carlton Hotel, North Bridge, Edinburgh. 7 p.m.

I.E.E. (Maidstone). "The New I.E.S. Code" (Joint meeting with Association of Supervising Electrical Engineers). Maidstone Technical College. 7 p.m.

I.E.E. (N.W. Utilisation Group). "Some Recent Developments in Oscillating Electrical Machines," Prof F. C. Williams. Electrical Engineering (Dover St) Laboratories, Manchester University. 6.15 p.m.

INSTITUTION OF MECHANICAL ENGINEERS (Lubrication and Wear Group). Discussion: "Refrigeration Lubrication." 1 Birdcage Walk, Westminster, S.W.1. 6 p.m.

INSTITUTION OF CIVIL ENGINEERS. Presidential address, Sir George McNaughton. Gt. George St, S.W.1. 5.30 p.m.

LIGHTMONGERS' SOCIETY. A.G.M. and dinner at Livery Hall, Guildhall, London.

INSTITUTION OF PLANT ENGINEERS (London). "Pilot-scale Research Work at the D.S.I.R. Warren Spring Laboratory," S. H. Clarke, B.S.A. John Adam St, W.C.2. 7 p.m.

INSTITUTION OF PLANT ENGINEERS (Peterborough). "Application of Modern Industrial Switch and Control Gear," P. C. Belton. White Lion Hotel, Church St. 7.30 p.m.

A.S.E.E. "Electrical Propulsion Devices in Space Flight," Dr L. R. Shepherd. Wolverhampton and Staffordshire College of Technology, Wulfruna St, Wolverhampton. 6.15 p.m.

A.S.E.E. (Gloucester and District). "11 kV Jointing and Boxes," Royal Hotel, Station Rd, Gloucester. 8 p.m.

A.S.E.E. (Reading and District). "Copper and Its Uses." East Berks College of Further Education, Boyne Hill Ave, Maidenhead, Berks. 7.30 p.m.

A.S.E.E. (S.E. London). "Earth Resistance and Earth Loop Testing," J. V. Gomersall. Eltham Green School, Queenscroft Rd, Eltham, London S.E.9. 7.45 p.m.

A.S.E.E. (W. London). "Recent Developments in Discharge Lighting," J. J. French. The White Hart, 49 King's Road, Chelsea, London, S.W.3. 7.45 p.m.

WEDNESDAY, 8 NOV.

I.E.E. (Measurement and Control). Conference on Non-destructive Testing in Electrical Engineering until 10 Nov. Savoy Pl, W.C.2.

Meetings to Note—continued

I.E.E. (Oxford). "Unconventional Methods of Energy Conversion," P. D. Dunn. Demonstration Room, Southern E.B., 37 George St, Oxford. 7 p.m.

I.E.E. (S.W. Scotland). "Education: Why Bother?" K. R. Sturley. Institution of Engineers and Shipbuilders, 39 Elmbank Cres, Glasgow C.2. 6 p.m.

I.E.E. (Southern). "The Protection of High Voltage Insulators from Power Arc Damage," A. E. Guile, S.E.B. Showrooms, 17 New Canal, Salisbury. 6.30 p.m.

I.E.E. (Western Utilisation Group). "Silicon Power Rectifiers," A. J. Blundell, A. E. Garside, R. G. Hibberd and I. Williams. S.W.E.B. Demonstration Theatre, Bath. 6 p.m.

I.E.E. (N. Lancs). "The Shielding of Overhead Lines Against Lightning," J. H. Grindley. N.W.E.B. Demonstration Theatre, North Rd, Lancaster. 7.30 p.m.

I.E.E. (N.W. Electronics and Communications Group). "Data Transmission," R. H. Franklin and J. Rhodes. Engineers' Club, Albert Sq, Manchester 2. 6.15 p.m.

INSTITUTION OF MECHANICAL ENGINEERS. Nominated lecture: "Gear-tooth Contact Phenomena," Dr H. E. Merritt. 1 Birdcage Walk, Westminster, S.W.1. 6 p.m.

I.E.S. (Bath and Bristol Centre). Joint meeting with British Lighting Council and Bristol and Somerset Society of Architects. Royal West of England School of Architecture, Gt. George St, Bristol.

BRITISH INSTITUTION OF RADIO ENGINEERS (Medical Electronics Group). "Electronics in Chromatography," E. L. Gregory and E. A. Piper. London School of Hygiene and Tropical Medicine, Keppel St, W.C.1. 6 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (N. Eastern). "A Pulse Time Multiplex System for Stereophonic Broadcasting," G. D. Browne. The Institution of Mining and Mechanical Engineers, Melville Hall, Westgate Rd, Newcastle upon Tyne. 6 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (Scottish). "Ultra High Speed Photography," W. A. Jones. Department of Natural Philosophy, The University, Drummond St, Edinburgh. 7 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (S. Wales). "High Frequency Induction Heating and Dielectric Heating," W. D. Wilkinson. Welsh College of Advanced Technology, Cardiff. 6.30 p.m.

INSTITUTION OF PLANT ENGINEERS (Western). "Organsiation of Planned Maintenance," H. Bamford-Preston. Grand Hotel, Broad St, Bristol.

A.S.E.E. (Birmingham Branch). "The Kariba Dam Project," H. J. Beard. The Engineering and Building Centre, Stephenson Pl, Birmingham 2. 7.30 p.m.

A.S.E.E. (Luton). "Developments of Oil-fired Boiler Control Gear," J. S. Smith. Luton College of Technology, Park Sq, Luton. 8.15 p.m.

THURSDAY, 9 NOV.

I.E.E. (N. Scotland). "Thermistors—Their Theory, Manufacture and Application," R. W. A. Scarr and R. A. Setterington. Electrical Engineering Dept., Queen's College, Dundee. 7 p.m.

I.E.E. (S.W. Sub-Centre). Third Hunter Memorial Lecture: "The Application of Electronics to the Electricity Supply Industry," J. S. Forrest. Lecture Theatre, S.W.E.B., Electric Hse, The Parade, Taunton. 3 p.m.

I.E.E. (W. Wales). "A Survey of Street Lighting and Its Future," W. R. Stevens and H. M. Ferguson. Electricity Board Showrooms, The Kingsway, Swansea. 6 p.m.

I.E.E. (N.E. Graduates and Students). "F.M. Reception." A. C. Davies. Sunderland Technical College. 6.30 p.m.

INSTITUTION OF MECHANICAL ENGINEERS (Automatic Control Group). Brains Trust on Automatic Control. 1 Birdcage Walk, Westminster, S.W.1. 6 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Liverpool). "Our Technology and Our Society," G. C. Eltenton. M.A.N.W.E.B. Industrial Centre, Paradise St. 7 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Teesside). Symposium on Modern Instrument Maintenance. Cleveland Scientific and Technical Institution, Middlesbrough. 7.30 p.m.

I.E.S. (Manchester Centre). "Lighting for Christmas," E. P. Lee. Demonstration Theatre, N.W.E.B., Town Hall Extension, Manchester 2. 6 p.m.

RADAR AND ELECTRONICS ASSOCIATION. "Space Communications," Part II: Orbits and Their Economics," W. F. Hilton. Lecture Hall, R.S.A., John Adam St, Adelphi, W.C.2. 7 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (Scottish). "Ultra High Speed Photography," W. A. Jones. Institute of Engineers and Shipbuilders, 39 Elmbank Crescent, Glasgow. 7 p.m.

R.S.A. "New Developments in the use of Solar Energy," H. Heywood. John Adam St, W.C.2. 5.15 p.m.

INSTITUTION OF PLANT ENGINEERS (Glasgow). "Industrial Air Conditioning," V. C. Taylor. Scottish Bldg Centre, 425 Sauchiehall St. 7.15 p.m.

R.S.A. (Commonwealth). "New Developments in the Use of Solar Energy," H. Heywood. John Adam St, Adelphi, W.C.2. 5.15 p.m.

A.S.E.E. (Bradford and District). "The British Standard Motor," J. L. Browell. Midland Hotel, Bradford. 7.30 p.m.

A.S.E.E. (Southampton). "Electricity in Agriculture," D. W. Holley. Cathedral Hotel, Salisbury. 8 p.m.

FRIDAY, 10 NOV.

I.E.E. (N. Scotland). "Thermistors—Their Theory, Manufacture and Application," R. W. A. Scarr and R. A. Setterington. Robert Gordon's Technical College, Aberdeen. 7.30 p.m.

I.E.E. (Tees-side). Annual dinner and reunion. Zetland Hotel, Saltburn. 7.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Midlands). "The Mathematics of Process Control," P. G. Farley. Lecture Theatre, Byng Kendrick Suite, Gosta Green College of Technology, Aston St, Birmingham. 7 p.m.

E.P.E.A. (Meter Engineers' Technical Group). "Demand Metering," W. Casson. Caxton Hall, Westminster, S.W.1. 6.30 p.m.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (Non-Destructive Testing Group). Discussion: The Role Played by Dislocation in Determining Mechanical Properties of Materials. 47 Belgrave Sq, S.W.1. 2.15 p.m.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (S. Wales). "Colour Television: Principles and Practice," K. Hacking, College of Technology, Newport. 6 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (Southern), "Recent Advances in Low Noise Microwaves Valves," Dr D. G. Kiely. Portsmouth College of Technology. 7 p.m.

ELECTRICAL INDUSTRIES BALL at Grosvenor Hse, Park Lane. 7.30 p.m.

SATURDAY, 11 NOV.

A.S.E.E. (S. Essex). Annual dinner and dance. Horseshoe Hotel, Tottenham Court Rd, W. 6 p.m.

MONDAY, 13 NOV.

I.E.E. (Mersey and N. Wales). "Some Notes on the Electrical Requirements of General Cargo Docks," E. R. Radway. Royal Institution, Liverpool. 6.30 p.m.

I.E.E. (N.E.). "Analysis of Overall Stability of Multi-machine Power Systems," J. G. Miles; and "Electronic Analogue Computer Simulation of Multi-machine Power System Networks," A. S. Aldred. Neville Hall, Westgate Rd, Newcastle upon Tyne. 6.15 p.m.

I.E.E. (N. Staffs). "Data Transmission," R. H. Franklin and J. Rhodes. Duncan Hall, Stone, Staffs. 7 p.m.

I.E.E. (S. Midlands). "Lighting for Monochrome TV Productions," P. Catlett; and "Colour TV Production Problems," I. Atkins. Winter Gardens, Malvern. 7.30 p.m.

I.E.E. (Western). "Technical and Economic Aspects of the Supply of Reactive Power in England and Wales," W. Casson and H. J. Sheppard. University Engineering Laboratories, Bristol. 6 p.m.

I.E.E. (London Graduates and Students). "The Work of the B.B.C. with Particular Reference to Transmitters," R. W. Leslie. Savoy Pl, W.C.2. 6.45 p.m.

I.E.E. (S. Midlands Supply and Utilisation Group). "Electricity in the Manufacture of Hydrogen-peroxide," B. E. A. Vigers and R. O. Fletcher. College of Advanced Technology, Gosta Green, Birmingham. 6 p.m.

I.E.E. (Scottish Electronics and Measurement Group). "Numerical Control of Machine Tools," D. F. Walker. Royal College of Science and Technology, Glasgow. 6 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Manchester). Joint meeting with Institute of Physics and the Physical Society. "The Role of the Physicist in Plant Instrumentation," Dr L. J. R. Postle. Manchester University.

I.E.S. (Sheffield Centre). "The New I.E.S. Code," H. E. Bellchambers. Grand Hotel, Sheffield. 6.30 p.m.

I.E.S. (Stoke-on-Trent). "Lighting Journey Down the Rhine." E. J. Smith. North Stafford Hotel, Stoke-on-Trent. 6.30 p.m.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Wildon and Co. Ltd. Creditors to send details to liquidator: J. A. Freeman, 8 Manchester Rd, Bury, by 15 Nov.

G. and T. Electrics Ltd. Winding-up order dated 16 Oct.

Rowyn Ltd. Winding-up order dated 16 Oct.

Warden Electrics Ltd. First meetings of creditors and contributories to be held at Official Receiver's Office, Somerset Hse, 37 Temple St, Birmingham 2, on 7 Nov., at 11 and 11.30 a.m., respectively.

Aldens of Exeter Ltd. Mr W. Fisher, Richmond Hse, Fore St, Teignmouth, appointed liquidator at extraordinary general meeting on 5 Oct. for the purpose of voluntarily winding-up.

Electric House (F.G.H.) Ltd. Mr L. H. Shipton, 31 Lloyd St, Manchester 2, appointed liquidator at extraordinary general meeting on 19 Oct. for the purpose of voluntarily winding-up.

Declo Ltd. First meetings of creditors and contributories to be held at Room 401, Inveresk Hse, 346 Strand, W.C.2, on 3 Nov., at 2.30 and 3 p.m., respectively.

Wainwright (Leeds) Ltd. First meetings of creditors and contributories to be held at Official Receiver's Office, Pearl Chmbrs, East Parade, Leeds 1, on 2 Nov., at 11 and 11.30 a.m., respectively.

Domestic Refrigeration Co. Ltd. First meetings of creditors and contributories to be held at Official Receiver's Office, 3-7 Holy Green, The Moor, Sheffield 1, on 7 Nov., at 11 and 11.30 a.m., respectively.

BANKRUPTCY ACTS

Receiving Orders

Carlisle. G. H. Mattinson, builder and electrical contractor, carrying on business at The Forge, Waver Bridge, Wigton. Receiving order dated 17 Oct.

Liverpool. I. M. Swallow, electrical contractor, formerly carrying on business as Electrical Repairs and Trading Co. at 19 Blyth Hey, Litherland. Receiving order dated 16 Oct.

Scarborough. C. Parker, refrigeration and electrical sales and service proprietor, formerly carrying on business at 4 Newlands Park Rd. Receiving order dated 17 Oct.

First Meetings and Public Examinations

Edmonton. Phoenix Enfield Supplies, appliance retailers, of 11 Napier Rd, Ponders End. First meeting: 12 noon, 8 Nov., at City Gate Hse, 39-45 Finsbury Sq, E.C.2; and public examination: 10.30 a.m., 12 Dec., at Court Hse, Fore St, N.18.

Bradford. M. C. Cornish, electrical dealer, formerly carrying on business at 1 Kipping La, Thornton. First meeting: 11.30 a.m., 2 Nov., at Official Receiver's Office, 20 North Parade, Bradford 1; and public examination: 10.30 a.m., 8 Jan., at County Court, Manor Row, Bradford 1.

Derby. R. James, radio, television and electrical appliance retailer, formerly carrying on business in partnership as Fourways Electrical Services at 68 Carter La, Mansfield. Public examination: 10 a.m., 23 Jan., at Court Hse, 20 St. Peter's Church Yard, Derby.

Appointment of Trustee

Newcastle upon Tyne. J. A. Parker, electrical appliance dealer, formerly carrying on business as Household Refrigeration at Newcastle and Cullercoats and previously as Cardiff Vacuum Cleaner Co. at St. Mary's St, Cardiff. Mr. E. Taylor, 30-32 Grey St, Newcastle, appointed trustee as from 19 Oct.

Release of Trustee

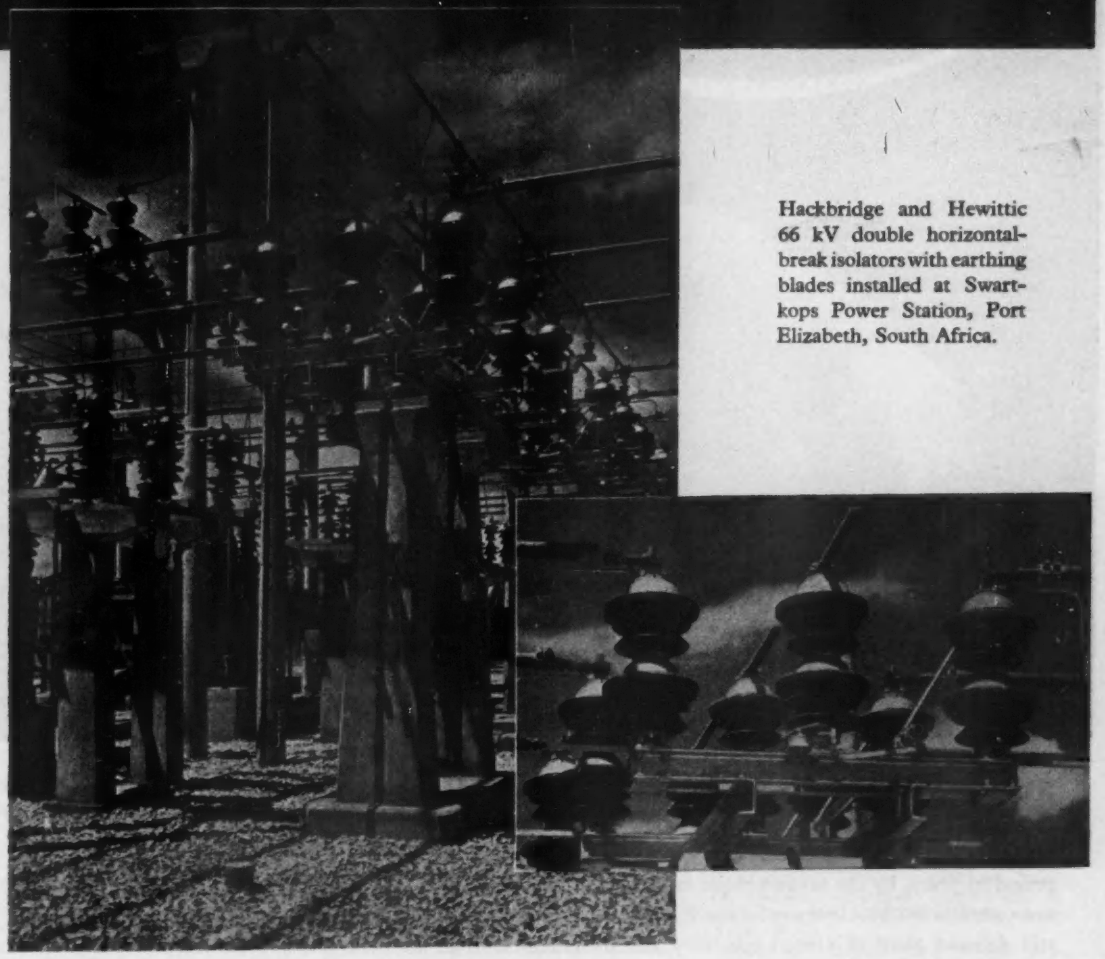
High Court of Justice. T. A. Edwards, radio retailer and electrical engineer, carrying on business as Edwards Electrical and Radio at 384 Finchley Rd, N.W.2. Trustee: A. A. Walter, Bankruptcy Bldgs, Carey St, W.C.2, released as from 16 Oct.

Intended Dividend

Wakefield. C. Arrand, agricultural and electrical engineer, carrying on business at 44 High St, Rawcliffe. Last day for receiving proofs for intended dividend: 10 Nov., by trustee: S. D. Moore, 4 Silver St, Hull.

HACKBRIDGE AND HEWITTIC

H.V. OUTDOOR OVERHEAD LINE ISOLATORS



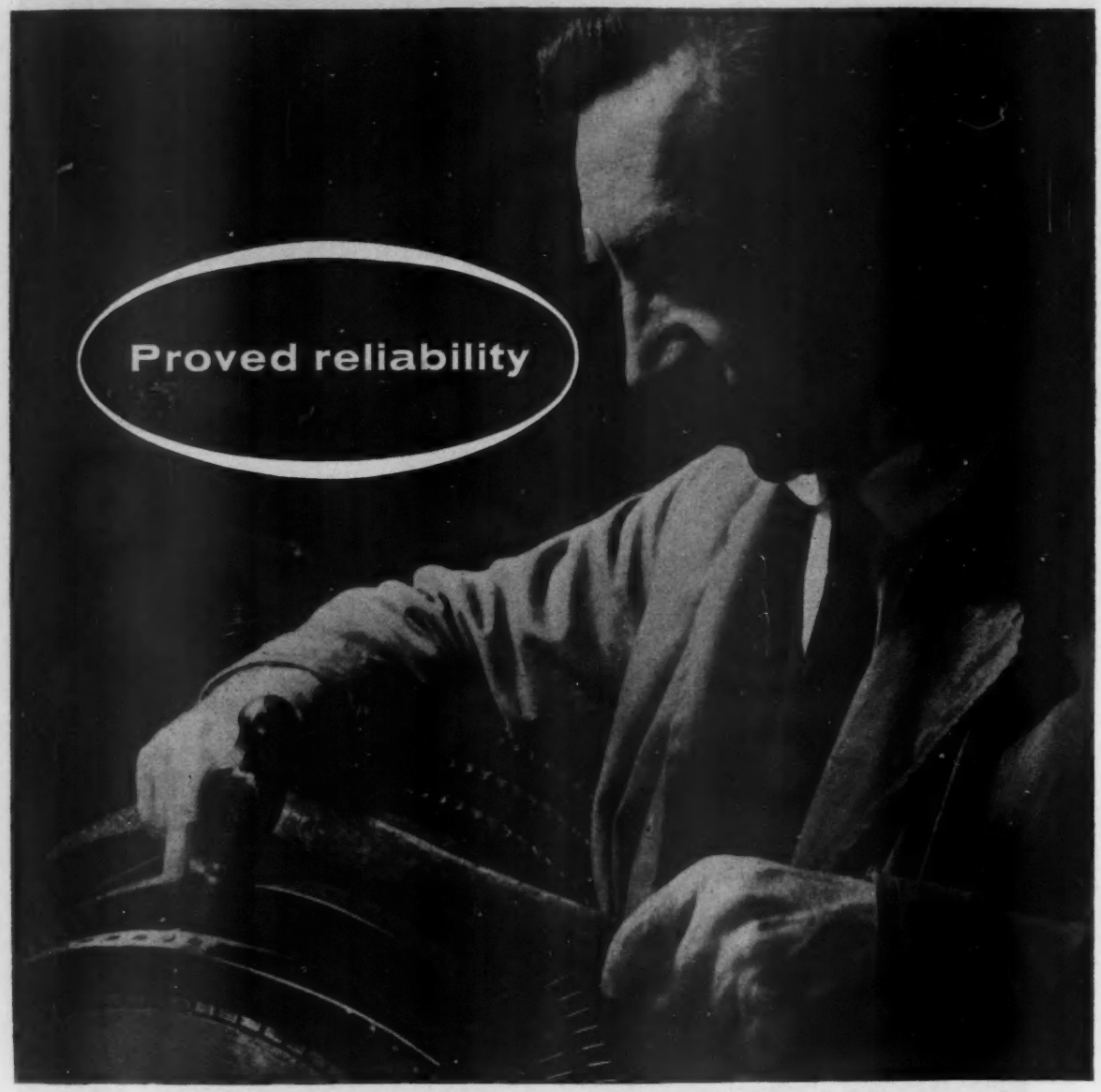
Hackbridge and Hewittic 66 kV double horizontal-break isolators with earthing blades installed at Swartkops Power Station, Port Elizabeth, South Africa.

HACKBRIDGE AND HEWITTIC ELECTRIC CO. LTD.

HERSHAM · WALTON-ON-THAMES · SURREY

Telephone: Walton-on-Thames 28833 (8 lines) Telegrams & Cables: Electric Walton-on-Thames

BEHIND THE MACHINE... in small steam turbines



It is recognised that, where steam is needed for process work or heating, a back pressure or extraction steam turbine-generator can, in nearly all cases, pay for itself over a short period of years, by the savings made in electricity costs. But even where a machine will pay for itself, experienced engineers still demand plant of proved reliability and robustness and this is why more small steam turbine-generators are bought from AEI than from any other British manufacturer.

Riveting the blade shrouding of a small steam turbine at Trafford Park. Machines like these are built to proved designs by skilled craftsmen who know their jobs 'inside out'. They know, as well, that the quality of all the materials they handle is assured by the most rigid and up-to-date inspection system in the world.

AEI makes **geared turbine-generators** from 300 kW and **direct-coupled** machines from 5,000 kW. Designs include **back-pressure** and **extraction** machines. Geared sets can be **self-contained** with the condenser integral with the exhaust casing.

For advice and help on any aspect of turbine generators from the largest power station plant to the smallest industrial turbine get in touch with AEI

BRITAIN'S LARGEST MANUFACTURER OF TURBINE-GENERATORS

AEI **Associated Electrical Industries Ltd**
Turbine-Generator Division

TRAFFORD PARK, MANCHESTER 17 WORKS AT MANCHESTER · RUGBY · GLASGOW · LARNE

B/L 005

CLASSIFIED ADVERTISEMENTS

PUBLIC NOTICES

EAST ANGLIAN REGIONAL HOSPITAL BOARD

Contracts for Engineering Services

THE Board invite applications for inclusion in their approved list of contractors for hospital engineering services in the East Anglian Region (Cambridgeshire, Isle of Ely, Norfolk, Huntingdonshire, East and West Suffolk, Soke of Peterborough and parts of South Lincolnshire and North Essex). Applications for further details from the Board's Engineer, Anstey Hall, Trumpington, Cambridge, by 11 Nov., 1961. Firms already on the list need not re-apply unless they wish to amend the class of work, cost range and/or area of operation for which they are already included. (C 445)

ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS

Diploma Scheme

and Premium Awards 1962

Notice is hereby given that the oral section of the A.S.E.E. Diploma Examination will be held at London and Provincial Centres on 8, 9 and 10 May, 1962. The subjects for the examination are Electrical Installation Practice, or Electrical Maintenance Practice, or Industrial Electronics and Control. The scheme provides for the award of premiums.

Application forms and details of the examination may be obtained from the undersigned at 23 Bloomsbury Sq, London W.C.1.

The latest date for receipt of applications to enter the examination is 1 March, 1962.

E. A. Bromfield,
General Secretary.

(C 434)

TENDERS INVITED

GOVERNMENT OF HONG KONG

Plover Cove and Hebe Haven Water Scheme

Electrical Plant

THE Crown Agents for Oversea Governments and Administrations, on behalf of the Government of Hong Kong, invite tenders from major electrical manufacturing firms (preferably represented and offering after-sales service in Hong Kong) for the supply and installation of electrical plant for pumping stations and treatment works in the New Territories of Hong Kong. The plant includes switchboards up to 6·6 kV, incorporating starters for pumpsets up to 1,150 h.p., transformers, small diesel alternators, distribution boards, air conditioning plant and lighting fittings, whilst the installation includes for all necessary cabling.

Applications for tender documents should be made to the offices of the Crown Agents, quoting reference E.C.2 Hong Kong 4758, and should be accompanied by a deposit of £10 which will be refunded only on receipt of a bona fide tender.

continued in next column

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Tenders should be delivered on or before Thursday, 28 Dec., 1961.

The Consulting Engineers are Messrs Binnie, Deacon and Gourley, Artillery Hse, Artillery Row, London S.W.1, and Messrs Scott and Wilson, Kirkpatrick and Ptnrs., Manson Hse, Nathan Rd, Hong Kong.

Crown Agents for Oversea Governments and Administrations,
4 Millbank, London S.W.1.

(C 439)

CITY OF MANCHESTER—HOUSING COMMITTEE

TENDERS are invited (returnable noon, 20 Nov., 1961) for a Communal TV Distribution Installation at Contracts 326A, Band C, 575 maisonnettes and flats, Miles Platting.

Particulars and documents obtainable from the Director of Housing, Town Hall, Manchester 2. (C 458)

SOUTHAMPTON C.B.C.

INVITES quotations for Electrical Installation at the College of Technology.

Write to Borough Architect, Civic Centre, Southampton, by 18 Nov., 1961. Quotation returnable by 18 Dec., 1961. (C 438)

BOROUGH OF WORKSOP

STREET LIGHTING

TENDERS are invited from bona-fide contractors for the removal of existing street lighting standards and for the supply, erection and servicing of the undermentioned street lighting units:

217 sodium lanterns, 60 watt mounted on 15 ft concrete columns.

Tenderers may quote for:

1. Supplying only the lanterns, auxiliary equipment and lamps; or
2. The removal of existing lighting units and the supply of new standards together with the wiring and fitting of all equipment; or
3. The whole of the work required.

Copies of the specification, bills of quantities and forms of tender may be obtained from the Borough Engineer, Park Hse, Worksop, upon payment of a deposit of £3 3s, which will be reimbursed upon the receipt of a bona-fide tender.

Tenders, in sealed envelopes, endorsed "Street Lighting," must reach the undersigned not later than 10 a.m. on Monday, 27 Nov., 1961.

The lowest or any tender will not necessarily be accepted.

RUSSELL C. PHARAOH,
Town Clerk.

Town Hall,
Worksop.
27 Oct., 1961. (C 479)

APPOINTMENTS VACANT

COUNTY OF LANARK

TECHNICAL ASSISTANT

REQUIRED for lighting section of County Roads Department, Hamilton.

continued in next column

continued from previous column

Salary Scale: £715/£785 with placing according to qualification and experience.

A Superannuation Scheme applies and a five-day week is in operation.

Candidates should have passed Higher National Certificate in Electrical Engineering or Intermediate Examination of City and Guilds in Illuminating Engineering and have experience in preparing working drawings and plans, and preferably relating to street lighting installations.

Applications stating age, qualifications and experience should be sent to the undersigned.

IAN V. PATERSON,
County Clerk.

P.O. Box No. 1,
Glasgow. (C 432)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Region

Research and Development Department

THIRD ASSISTANT ENGINEER

ELECTRICAL BRANCH

Vacancy No. S.E.54/61.

APPLICATIONS are invited for the post of Third Assistant Engineer in the Measurements and Instrumentation Section. The post will be located at West Farm Pl, Cockfosters, and the successful applicant will be expected to reside within a reasonable distance of Cockfosters.

The successful candidate will be responsible to the Measurements and Instrumentation Section Head and will carry out special field work, developing his own techniques in radio and television interference measurements, noise level measurements, noise suppression, harmonic and vibration analysis, mechanical stress and strain analysis and allied work. This post requires experience in electronics and measurement techniques.

A recognised electrical engineering qualification leading to Corporate Membership of the Institution of Electrical Engineers or qualifications leading to Corporate Membership of the British Institution of Radio Engineers is desirable and previous research and development experience would be an advantage.

Salary, dependent on qualifications and experience, within the range of £1,215/£1,780 per annum, including London Allowance, in accordance with N.J.B. Salary Agreement, Class L, Grade 6/7/8.

Applications, quoting Vacancy No. and stating age, qualifications, experience, etc., should be forwarded to the Regional Secretary, Ergon Hse, Horseferry Rd, S.W.1, to arrive not later than 18 Nov., 1961. (C 452)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

Staff Vacancy

No. 1 Sub-Area

THIRD ASSISTANT ENGINEER

(PROTECTION)

REQUIRED at No. 1 Sub-Area Headquarters, Liverpool. Salary will be within the range of £1,275/£1,410 per annum (N.J.B. M.10).

Duties will include power system protection and the testing and commissioning of h.v. cables, switchgear, transformers and associated equipment up to 33 kV.

Applicants should have had a general experience in the Electricity Supply Industry and be technically qualified.

Special application forms obtainable from the Manager, No. 1 Sub-Area, 24 Hatton Garden, Liverpool 3, should be returned not later than 17 Nov., 1961. (C 469)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 46s. per inch, and all other classified advertisements at 3s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

SOUTH OF SCOTLAND ELECTRICITY BOARD

Glasgow Area

APPLICATIONS are invited from suitably qualified engineers for the following superannuable appointments:

(1) THIRD ASSISTANT ENGINEER

(CONSTRUCTION)

Ref. No. GE/74/61.

Candidates should have a sound theoretical knowledge and practical training with experience in the erection and commissioning of E.H.V. switchgear, transformers and protection gear and general substation construction work, and be capable of supervising engineers working in a junior capacity. Corporate Membership of the Institution of Electrical Engineers or equivalent qualification is desirable.

Salary: £1,275/£1,410 per annum in accordance with Class L, Grade 9 (Scale 11) of the N.J.B. Salary Scale.

(2) THIRD ASSISTANT ENGINEER

(PLANNING AND DEVELOPMENT)

Ref. No. GE/71/61.

Candidates for this post should preferably be in possession of the H.N.C. in Electrical Engineering or equivalent qualification and should have a sound engineering training with subsequent experience in the design and layout of large distribution systems at pressures up to and including 33 kV in a densely loaded industrial and residential area. A knowledge of the application of modern protective equipment and of the calculation of fault levels and preparation of load flow diagrams is desirable.

Salary: £1,190/£1,325 per annum in accordance with Class L, Grade 10 (Scale 10) of the N.J.B. Salary Scale.

(3) FOURTH ASSISTANT ENGINEER

(METER, TEST AND PROTECTION)

Ref. No. GE/72/61.

Candidates for this post should preferably be in possession of the H.N.C. in Electrical Engineering or equivalent qualification. The successful candidate will be primarily concerned with the installation and in situ testing of polyphase metering and ancillary equipment. Experience in the use of potentiometer equipment to comply with the requirements of the Electricity Supply (Meter) Act, 1936, will be an advantage.

An opportunity to gain experience in other work in the section will be given.

Salary: £965/£1,090 per annum in accordance with Class L, Grade 13 (Scale 7) of the N.J.B. Salary Scale.

The successful candidates for these posts shall be required to reside within reasonable travelling distance of Area Headquarters.

Applications, quoting appropriate reference number, should be submitted on the standard application form, which is obtainable from the Area Secretary, P.O. Box 6, 75 Waterloo St, Glasgow C.2, and should be returned not later than Friday, 17 Nov., 1961. (C 465)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

Staff Vacancy

No. 2 Sub-Area

THIRD ASSISTANT ENGINEER (PLANNING)

REQUIRED at the Board's No. 2 Sub-Area Headquarters, Sandiway Hse, Northwich, Cheshire. Salary within range £1,190/£1,325 per annum (N.J.B. L.10, Scale 10).

Applicants should have received a sound training in overhead and underground distribution work and have a good knowledge of the technical and economic principles underlying the design of distribution systems. Possession of an appropriate technical qualification is desirable.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager at the above address. Closing date: 17 Nov., 1961. (C 463)

YORKSHIRE ELECTRICITY BOARD

No. 4 (Leeds) Sub-Area

WETHERBY DISTRICT

DISTRICT COMMERCIAL ENGINEER

APPLICANTS should be conversant with all matters connected with a District Commercial organisation in a mixed rural and urban district and have had experience in negotiating with agricultural and industrial consumers, installation and contracting, public lighting, service centre organisation and load development, and the preparation of statistics and reports.

Salary: N.J.B. Class F, Grade 3 (Scale 12), £1,350 x £30—£1,500 per annum).

Sub-Area Headquarters

FOURTH ASSISTANT ENGINEER

(DRAUGHTSMAN)

Applicants should have had a good general and technical education and be experienced in the layout of plant in substations and in the preparation of electrical diagrams.

Salary: N.J.B. Class L, Grade 12 (Scale 8), £1,040/£1,165 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, Leeds, not later than 17 Nov., 1961.

No. 2 (Huddersfield) Sub-Area

HALIFAX DISTRICT

INSTALLATION ENGINEER

Applicants should have served a recognised apprenticeship and have had considerable experience in estimating and control of labour engaged on domestic, commercial and industrial installations and maintenance.

Salary: N.J.B. Class J, Grade 8 (Scale 10), £1,190/£1,325 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market St, Huddersfield, not later than 17 Nov., 1961.

No. 3 (Sheffield) Sub-Area

ECCLESFIELD DISTRICT

THIRD ASSISTANT DISTRICT ENGINEER

Applicants should have had experience in the work of a District Engineering Department.

Salary: N.J.B. Class G, Grade 9 (Scale 7), £965/£1,090 per annum.

ROTHERHAM AND MEXBOROUGH DISTRICT

DEMONSTRATOR

Applicants should have successfully undertaken a recognised course in domestic subjects and preferably possess the certificate of the Electrical Association for Women.

They must have experience in cooking practice, demonstration of electrical appliances, and be capable of advising consumers on the use of electricity in the home.

The successful candidate will have to give public demonstrations.

Salary: N.J.C. Grade 1, £600 x £25—£700 per annum.

Applications, together with the names of two referees, should be sent to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Change Alley, Sheffield, not later than 17 Nov., 1961. (C 471)

KENT EDUCATION COMMITTEE

Gravesend Technical College

APPLICATIONS are invited for the appointment of an

ASSISTANT LECTURER (GRADE A)

for engineering subjects, theoretical and practical, in connection with electrical installation and electrical technicians' courses.

Candidates should be appropriately qualified with good industrial experience. Some teaching experience is desirable.

Salary Scale: Burnham Technical Scale, £520 x £27 x £40—£1,000.

Application forms and further particulars from the Principal, Technical College, Darnley Rd, Gravesend. (C 436)

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Region

ELECTRICAL ENGINEER'S DEPARTMENT

THIRD ASSISTANT ENGINEER

REQUIRED in the Plant Design and Investigations Section of the Technical Branch based on Leeds.

The Section is concerned with design problems relating to the major electrical plant items in power stations and on the transmission system and the investigation of faults and breakdowns, including the preparation of reports.

Candidates should have had manufacturing, operating or design experience in the generation or transmission field and technical qualifications leading to Corporate Membership of the I.E.E.

The salary for this appointment will be in accordance with the National Joint Board Agreement, Grade 8, Class K (£1,145/£1,410 per annum).

Forms of application may be obtained from the Regional Personnel Officer, Central Electricity Generating Board, North Eastern Region, 1 Whitehall Rd, Leeds, 1 to whom they should be returned to arrive not later than 10 Nov., 1961. (C 425)

LONDON ELECTRICITY BOARD

CIVIL/STRUCTURAL ENGINEERING

DRAUGHTSMAN

APPLICATIONS are invited for the above position under the supervision of a Structural Engineer in the Construction Branch of the Chief Engineer's Department in Central London (Waterloo).

Candidates (minimum age 22 years) should have had at least four years' experience in reinforced concrete detailing work and have obtained the Ordinary National Certificate (Building).

The post is graded under Schedule A of the National Joint Board Agreement, Class K (Area) as Grade 13, £820 rising to £1,065 per annum, inclusive of London Allowance.

Application form obtainable from the Construction Engineer, Lesco Hse, Stamford St, London S.E.1. Please quote ref.: PER/V/3318/T. (C 450)

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Region

REGIONAL ELECTRICAL DEPARTMENT

APPLICATIONS are invited for the positions of

THREE FOURTH ASSISTANT ENGINEERS

(MEASUREMENTS)

in the Technical Branch of the Regional Electrical Department as follows:

(a) One Engineer to be based at Newcastle upon Tyne to assist in site maintenance and testing of electrical measuring apparatus.

The appointment will be made at National Joint Board, Grade 10, in the Regional Classification, Class K (£980/£1,245 per annum).

(b) Two Engineers to be based at Leeds to assist in maintenance and testing of electrical measuring apparatus in the Regional Testing Laboratory.

The appointments will be made at National Joint Board, Grade 11, in the Regional Classification, Class K (£900/£1,165 per annum).

Applicants should preferably have had experience in the testing and calibration of precision polyphase and summation metering equipments associated with H.V. bulk supplies, indicating instruments and laboratory standardisation, and possess a Higher National Certificate in Electrical Engineering or its equivalent.

Applications stating the post applied for should be made on Form AE6, obtainable from the Regional Personnel Officer, Central Electricity Generating Board, North Eastern Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than 8 Nov., 1961. (C 395)

BRADFORD INSTITUTE OF TECHNOLOGY

Department of Electrical Engineering

APPLICATIONS are invited for the posts of

SENIOR LECTURER AND LECTURERS IN ELECTRICAL ENGINEERING

These vacancies are created by the rapid expansion of the Department, which is mainly concerned with Diploma in Technology courses, and the posts offer exceptional opportunities for teaching, consulting and research work.

Candidates should be suitably qualified to teach to final Diploma in Technology standard in electrical power *or* machines *or* electronics *or* telecommunications. Industrial and research experience will be a recommendation.

The successful candidate will be encouraged to develop industrial contacts and undertake research for which adequate facilities are available.

Salary scales (which are subject to revision at an early date) are as follows:

Senior Lecturer: £1,550/£1,750 per annum.

Lecturer: £1,370/£1,550 per annum.

Previous industrial and research experience at a suitable level will be taken into account in fixing the commencing salary.

Further particulars and forms of application may be obtained from the Registrar (Department M), Bradford Institute of Technology, Bradford 7.

HENRY PATTEN,
Clerk to the Governors.
(C 448)

SOUTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following positions:

SECOND ASSISTANT DISTRICT ENGINEER
WEST CORNWALL

Salary within Class G, Grade 7, Salary Scale 9, £1,115/£1,245 per annum of Schedule A of the N.J.B. Agreement.

The successful candidate will be required primarily to assist in the construction work on the distribution system up to and including 33 kV; his duties may also include giving assistance on operation and maintenance as and when required.

The person appointed will be required to take part in a rota of standby duty for the whole District to deal with faults and interruptions to supply.

Previous all-round experience on both H.V. and L.V. overhead and underground networks and substations in rural and urban areas, and appropriate technical qualifications at least equivalent to the Higher National Certificate are necessary. Possession of a current driving licence is desirable.

Applications for this post to be made on Standard Form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, 13 Basset Rd, Camborne. Closing date for receipt of completed applications is 18 Nov., 1961.

THIRD ASSISTANT DISTRICT ENGINEER
BATH

Salary within Class G, Grade 9, Salary Scale 7, £965/£1,090 per annum of Schedule A of the N.J.B. Agreement.

The duties of the successful candidate will be to assist generally in the planning, construction, operation and maintenance of overhead and underground lines, and substations for voltages up to and including 33 kV. The person appointed will be required to undertake standby duty.

Candidates should hold the Higher National Certificate in Electrical Engineering or qualifications leading to it. Possession of a current driving licence is desirable.

Applications for this post to be made on Standard Form AE6/ACT, OBTAINABLE BY POSTCARD ONLY from the District Manager, South Western Electricity Board, The Old Bridge, Bath. Closing date for receipt of completed applications is 18 Nov., 1961. (C 468)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

Birmingham Area

THIRD ASSISTANT DISTRICT ENGINEERS
(SOUTH EAST AND SOUTH WEST DISTRICTS)

Experience necessary in the construction, operation and maintenance of large h.v. and m.v. underground distribution and protective systems. Technical qualifications desirable. Salary: £1,190/£1,325 per annum (N.J.B. Class K, Grade 9). Apply, by letter, within 14 days, stating age, experience, present position and salary, to Emil Braathen, Area Manager, Midlands Electricity Board, 14 Dale End, Birmingham 4.

Central Gloucestershire Area

DEMONSTRATOR (FEMALE)
(DEAN FOREST)

Applicants must have a good education and should have a certificate of a recognised training college and/or the E.A.W. Certificate and at least two years' training and experience. Applicants must be prepared to take an active part in the sales organisation and selling experience would be an advantage. Duties include lecture demonstrations in Service Centres and on consumers' premises and advice to consumers on the selection and use of electrical apparatus. Salary: £600/£700 per annum (N.J.C. Grade 1). Apply, by letter, within 14 days, stating age, education, qualifications, training and experience, to Mr S. Raybould, Area Manager, Midlands Electricity Board, Eastern Ave, Gloucester.

North Staffs Area

THIRD ASSISTANT DISTRICT ENGINEER
(DRAUGHTSMAN) (STAFFORD)

The successful applicant to be responsible for the Drawing Office. Candidates should have a sound technical education and experience in the preparation of engineering drawings and electrical diagrams. Salary: £890/£1,015 per annum (N.J.B. Class F, Grade 9).

GENERAL ASSISTANT DISTRICT ENGINEER
(DRAUGHTSMAN) (STOKE SOUTH)

Applicants should have had a sound technical education and experience in the preparation of engineering drawings and electrical diagrams. Salary: £765/£870 per annum (N.J.B. Grade G.12).

Apply, by letter, within ten days, stating age, experience, qualifications, present position and salary, to Mr C. C. Pimble, Area Manager, Midlands Electricity Board, 234 Victoria Rd, Fenton, Stoke-on-Trent.

South Staffs and North Worcs Area

GENERAL ASSISTANT DISTRICT ENGINEER
(BRIERLEY HILL)

Applicants should have suitable technical qualifications and training in engineering duties associated with electricity distribution systems. Salary: £825/£940 per annum (N.J.B. Grade G.11).

Apply, by letter, within 14 days, stating age, experience, present position and salary, to Mr D. Holt, Acting Area Manager (Ref. EMI/SEC), Midlands Electricity Board, P.O. Box No. 9, Toll End Rd, Tipton, Staffs.

DEMONSTRATOR (FEMALE)
(WEDNESBURY)

Applicants must have a good education and should have a certificate of a recognised domestic training college and/or the E.A.W. Certificate and have at least two years' training and experience. Duties include lecture demonstrations in Service Centres and on consumers' premises and advice to consumers on the selection and use of electrical

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apparatus. Salary: £600/£700 per annum (N.J.C. Grade 1). Apply, by letter, within 14 days, stating age, education, qualifications, training and experience, to District Manager, Midlands Electricity Board, Camp St, Wednesbury.

F. W. CATER,
Secretary.
(C 446)

SOUTHERN ELECTRICITY BOARD

FIRST ASSISTANT DISTRICT ENGINEER
(MAINTENANCE AND OPERATION)

BASINGSTOKE District of No. 3 (Portsmouth) Sub-Area. Salary: N.J.B. Class F, Grade 5 (£1,275/£1,410 per annum). N.J.B. Conditions of Service.

Applicants, who must possess suitable technical qualifications, should have had extensive experience of system operation, and of the maintenance of switchgear, transformers and mains up to and including 33 kV, including minor construction work, and the commissioning of new mains and plant. The duties of the successful applicant include the supervision of technical staff engaged in this work.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton La, Cosham, Portsmouth, and returned to him, quoting Z.1430, not later than 13 Nov., 1961.

PLANNING ENGINEER

Basingstoke District of No. 3 (Portsmouth) Sub-Area. Salary: N.J.B. Class F, Grade 7 (£1,040/£1,165 per annum). N.J.B. Conditions of Service.

The duties will include the preparation of schemes and estimates for extensions and/or reinforcement to overhead and underground networks up to and including 33 kV. The appointment will involve standby duties.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton La, Cosham, Portsmouth, and returned to him, quoting Z.1429, not later than 13 Nov., 1961.

SENIOR ASSISTANT (PERSONNEL)

No. 3 (Portsmouth) Sub-Area Office. Salary: N.J.C. Grade 6 (£1,150/£1,240 per annum). N.J.C. Conditions of Service.

The duties of the post will be to assist in all work affecting personnel, establishments, education and training, and kindred matters in the Sub-Area.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton La, Cosham, Portsmouth, and returned to him, quoting Z.1409, not later than 13 Nov., 1961.

SENIOR ASSISTANT (ADMINISTRATION)

No. 2 (Newbury) Sub-Area Office. Salary: N.J.C. Grade 6 (£1,150/£1,240 per annum). N.J.C. Conditions of Service.

The duties of the post will be to assist in all matters of general administration outside the personnel field, including all duties in connection with the acquisition and sale of property, in the Sub-Area Secretary's Department.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, Berks, and returned to him, quoting Z.1410, not later than 13 Nov., 1961.

SERVICE REPRESENTATIVE

Aldershot District of No. 3 (Portsmouth) Sub-Area, located at the Petworth Branch. Salary: N.J.C. Grade 2 (£700 x £25—£775 per annum). N.J.C. Conditions of Service.

The duties of the post will be to advise on supply matters, tariffs, apparatus and sales to consumers with domestic or small commercial or industrial installations.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton La, Cosham, Portsmouth, and returned to him, quoting Z.1427, not later than 13 Nov., 1961.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible. (C 470)

Due to expansion the
CONTROL GEAR DIVISION
of
G.W.B. FURNACES LIMITED
require a
TECHNICAL SALES ENGINEER FOR SCOTLAND

The Company's products are particularly suited to heavy duty applications where reliability is of paramount importance and the post offers wide opportunities to a man with good engineering contacts.

Applicants should reside in the Glasgow area, but be prepared to travel. Previous sales experience and ability to discuss technical problems on automatic control gear essential. No electronics involved. Qualifications to H.N.C. preferred, age 25 to 40.

A car will be provided, together with a generous salary and incentive bonus.

Detailed applications, in confidence, which will be acknowledged, to:

Sales Manager, Control Gear Division, G.W.B. Furnaces Ltd., P.O. Box No. 4, Dibdale Wks, Dudley, Worcs.

(C 441)

CORPORATION OF LONDON

APPLICATIONS are invited from suitably experienced candidates for the permanent post of

RESIDENT DEPOT SUPERINTENDENT (MECHANICAL AND ELECTRICAL EQUIPMENT)

at the Corporation's new Public Cleansing Depot, Upper Thames St, E.C.4. Salary scale: £990/£1,310 p.a. Commencing salary according to qualifications and experience and with free flat accommodation at the Depot, available 12 months after appointment.

Candidates should hold a National Certificate in mechanical and/or electrical engineering. Preference will be given to those experienced in maintenance of industrial plant including oil-fired steam boiler plant and various types of electrical switchgear and motors.

Applications stating age, appointments held and experience, together with names of two referees, to The City Engineer, Guildhall, London E.C.2, by 14 Nov., 1961. (C 437)

WANTED
ELECTRICAL ENGINEER
(aged about 30-35)

for estimating and supervising electrical contracts. Good salary and bonus paid to keen, energetic man capable of accepting responsibility. Permanent position with pension. Assistance with housing, if necessary. Applications in writing (stating age, experience, technical qualifications and salary required) will be treated with strictest confidence and should be made to:

Messrs A. ANDERSON AND SON (ELECTRICAL ENGINEERS) LTD., 100 Grange Rd, MIDDLESBROUGH.

(C 475)

CENTRAL ELECTRICITY GENERATING BOARD
Midlands Region
East Midlands Division

ASSISTANT ENGINEER (CONTROL ROOM)
LEICESTER POWER STATION
Vacancy No. 235/61.

APPLICATIONS are invited for the position of Assistant Engineer (Control Room) at Leicester Power Station, Rawdykes Rd, Leicester.

Candidates for this post should be suitably qualified and have had experience in the control room.

Salary will be in accordance with Class G, Grade 13 (£715/£805 per annum) of the National Joint Board Agreement, plus £90 per annum allowance whilst engaged on shift duties.

Closing date for receipt of applications: 17 Nov., 1961.

This appointment is pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Station Superintendent, and should be returned to him by the date stated.

O. S. WOODS,
Assistant Regional Director.
(C 464)

CENTRAL ELECTRICITY GENERATING BOARD
West Midlands Division

STATION SHIFT CONTROL ENGINEER

REQUIRED at Walsall Power Station, Staffs. N.J.B. service conditions, superannuable appointment, salary within Schedule A of the Agreement, Grade J.10, £1,040/£1,165 per annum, plus 10% shift allowance.

A sound technical training and practical experience in the control of steam generating plant and main switchgear are required. Appropriate technical qualifications an advantage.

Apply, quoting Vacancy No. 244/61 MR on Form AE6, available from the Station Superintendent, Walsall Power Station, Reedswood La, Walsall, Staffs, to be returned by 13 Nov., 1961. (C 454)

THE EAST MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified and experienced persons for the following appointments. Applicants should state age, qualifications, experience, etc., and quote the appropriate Vacancy Number.

Mansfield and North Nottinghamshire Sub-Area

GENERAL ASSISTANT ENGINEER (PLANNING AND DEVELOPMENT)
Vacancy No. 121/61.

Salary: N.J.B. Class L, Grade 16, £765/£870 per annum.

The duties include assisting in the planning and preparation of schemes and specifications for the extension and reinforcement of overhead and underground distribution systems up to and including 11 kV, and the design and layout of substations.

GENERAL ASSISTANT DISTRICT ENGINEER
MANSFIELD DISTRICT (NEWARK)
Vacancy No. 122/61.

Salary: N.J.B. Class K, Grade 15, £765/£870 per annum.

The duties include assisting in the operation, maintenance, planning and construction of rural and urban networks up to and including 11 kV.

Ability to drive a motor vehicle is essential, and the person appointed will be required to live in or near Newark.

Applications for the above vacancies should be forwarded to the Manager, Mansfield and North Nottinghamshire Sub-Area, Lime Tree Place, Mansfield, Notts, by 17 Nov., 1961. (C 467)

DRAUGHTSMEN

required in long established and progressive company. Permanent and progressive position offered to men holding O.N.C. or equivalent who are used to producing a high standard of work and with experience in design layout and detailing in either of the following fields:

A.C. and D.C. electrical machines
Motor control gear and panels.

Details of qualifications and experience should be sent to the

General Manager,
Newton Brothers (Derby) Ltd.,
Alfreton Rd, Derby.

(C 449)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD
Northern Area

GENERAL ASSISTANT ENGINEER
WICK

APPLICATIONS are invited for the above post.

Minimum technical qualifications: Ordinary National Certificate in Electrical Engineering. Experience on H.V. and L.V. underground and overhead distribution systems will be an advantage.

Salary: Wick—£715/£805 (N.J.B. D.10, Scale 3).

Superannuation Scheme.

Application forms obtainable from Area Manager, High St, Dingwall, should be returned by 24 Nov., 1961. (C 435)

CENTRAL ELECTRICITY GENERATING BOARD
West Midlands Division

APPLICATIONS are invited for the position of

ASSISTANT ENGINEER (PLANNING)

at the Hams Hall "A," "B" and "C" Power Stations. Salary will be in accordance with the N.J.B. service conditions—Grade N.8 (£1,535/£1,720 per annum).

The successful applicant will be responsible for the detailed planning and and progressing of plant overhauls and other work carried out on the Hams Hall site. Candidates should preferably possess H.N.C. or equivalent. Practical experience in the operation and maintenance of a modern power station and an understanding of the economic consideration underlying planning are required.

Apply, quoting Vacancy No. 242/61 MR on form AE6, available from the Station Superintendent, Hams Hall Power Station, Lea Marston, Sutton Coldfield, Warwicks, to be returned by 13 Nov., 1961. (C 453)

SENIOR
ELECTRICAL ENGINEER

is required to join expanding team of old-established Contractors in LONDON.

A.M.I.E.E. preferable with DESIGN experience in Industrial Buildings. Must be able to take complete responsibility for designs and quality supervision in the field and co-operate closely with Architects, Structural and Mechanical Engineers.

A genuine opportunity for advancement with pension/assurance and bonus schemes. Five-day week, very modern office.

Write full details to: GENERAL MANAGER, Box No. 8459, Electrical Times.

(C 476)

The Electricity Council

DEPUTY CHIEF SAFETY OFFICER

Applications are invited for the superannuable post of DEPUTY CHIEF SAFETY OFFICER in the Industrial Relations Department at Winsley St.

Candidates should have practical engineering experience, a knowledge of accident prevention methods and their application, preferably in the Supply Industry, and be familiar with the Factories Acts and Regulations and other legal requirements regarding safety in the industry. They should have good engineering qualifications; corporate membership of one of the engineering institutions would be an advantage.

● ***Salary within the scale £2,655—£2,875 p.a. inclusive of London allowance.***

Applications stating age, present appointment and salary, qualifications and experience, to E. Landucci, Winsley St, W.1, by 18 Nov., 1961. Quote Ref. ET/135.

(C 442)

United Kingdom Atomic Energy Authority

THE CULHAM LABORATORY

for fusion and plasma physics research now being built at Culham, Abingdon, Berkshire, has vacancies for Shift Technicians for the Site Services Division. Shift Technicians will be responsible for the operation of all civil, mechanical and electrical site services and for liaison with the maintenance sections. There will be a fair degree of automation and hence some bias towards electrical engineering, but the successful candidates must be capable of operating all services.

Applicants should have served a recognised engineering apprenticeship or have similar qualifications. They should have had experience of site operation or maintenance and be prepared to work without supervision to maintain the continuity of the services. Some experience of control circuitry would be an advantage, whilst the possession of a Higher National Certificate is desirable.

Salary: £1,060/£1,210 per annum.

Housing and contributory superannuation scheme.

Send a postcard for application form and further details to:

The Senior Personnel Officer (CAP/40/38/49),
Culham Laboratory,
Culham,
Abingdon, Berks.

(C 473)

YOUNG ELECTRICAL ENGINEER

required to join a team responsible in preparing tenders for, and executing nuclear projects. This Engineer will be responsible for developing new construction procedures involving electrical techniques.

The position is one offering wide experience and is not purely electrical in scope. Successful applicant would be required to reside in London for approximately six months prior to taking up residence in the Glasgow area.

Write, giving age, precise details of previous positions held, qualifications and required salary to Box No. 8457, Electrical Times. (C 462)

DESIGNER DRAUGHTSMAN

Required for interesting work on Lighting Fittings, mainly fluorescent, Must have sound knowledge of engineering principles and be capable of original thought. The work requires a knowledge of modern manufacturing methods including pressue die casting, injection and compression moulding and extrusion of plastics, sheet metal fabrication and electrostatic painting.

Superannuation, canteen facilities, excellent working conditions. Apply to:

Personnel Officer,
Crompton Parkinson (Doncaster) Ltd.,
Wheatley, Doncaster. (C 440)

CONTROL ENGINEERING finds application in nearly every up-to-date Industry—Power Generation, Mining, Steel, Chemical, Oil, Machine Tools, Rubber and Plastics, Material Handling, Paper, Textiles, etc.

READ ALL ABOUT IT We are sure that there are many Electrical Engineers in these and other fields who would find an interesting and rewarding career in Control Engineering and for them brochures have been prepared describing not only the growth and activity of 'English Electric' at Kidsgrove, but also some interesting examples of Control Engineering. These we shall be happy to send on request.

SEE ALL ABOUT IT— There is a mobile display of some of the most up-to-date Control equipment which will be touring the country towards the end of November. If you happen to live or work in the vicinity of one of its stopping places, we shall be only too pleased to see you during the evening by appointment, and not only show you something of the up-to-date techniques being exploited in Control Engineering, but also discuss informally, and without obligation on either side, career opportunities in the Division.

CURRENT VACANCIES are for Control Engineers and Technical Sales Representatives. They need to be filled by men of about H.N.C. standard, or by those without formal qualifications who have extensive knowledge of and experience in conventional Control Gear.

WRITE NOW for the brochures mentioned above apply to: Director, Group Personnel Services, English Electric House, Strand, London W.C.2. Please quote reference ET316E. If you would like to see the mobile display or wish to make formal application for one of the above vacancies, please give also details of qualifications and experience to date.

'ENGLISH ELECTRIC'

CONTROL ENGINEERING

(C 457)

SENIOR ELECTRICAL DRAUGHTSMAN

required by

KODAK LIMITED

to work in its Project and Design Department. This Department is a member of the Engineering Division where over 1,000 people are employed. Candidates should be experienced in the preparation of schemes and specifications for internal distribution systems for factories. Qualifications up to H.N.C. or equivalent. Salary within range £900/£1,120 depending on experience.

The company offers excellent employee benefits, including an annual bonus, a voluntary part contributory Life Insurance Plan and a Pension Scheme.

Please apply quoting JAW/17,
Men's Personnel Department,
Kodak Limited (Factories),
Harrow, Middx.
(C 456)

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT ENGINEER

SUTTON DISTRICT

SALARY: £1,115/£1,245 per annum, plus London Allowance under N.J.B. Class G, Grade 7. This district (77,000 consumers) covers a dense urban area on the outskirts of London. Applicants of good general education should have had technical training to Higher National Certificate standard with practical experience of general distribution work, and be capable of carrying out planning, construction and maintenance work. Consideration will be given to a private car allowance and, in appropriate circumstances, to assistance with housing.

Applications, quoting ET, on forms from District Manager, Seeboard, 52 High St, Sutton, by 15 Nov., 1961.

LINESMAN (OVER 30 kV)

EAST SUSSEX AND SOUTH WEST KENT

Wages: 5s 6½d per hour for 42-hour, five-day week under N.J.I.C. Agreement. Duties involve erection and maintenance of overhead lines up to 33 kV in all parts of the sub-area, operating from the Eastbourne depot. Superannuation optional after two years' service.

Applications, quoting ET and naming two referees, to East Sussex and South West Kent Manager, Seeboard, Westlords, Willingdon Rd, Eastbourne, by 13 Nov., 1961.

GEORGE WRAY,
Secretary.
(C 466)

CENTRAL ELECTRICITY GENERATING BOARD

Western Division

ASSISTANT SHIFT CHARGE ENGINEER

W/AV/107/61.

required at Newton Abbot Power Station, Devon.

Superannuation Scheme. Salary: N.J.B. Class F, Grade 9, Scale 6, £890/£1,015, plus 10% Shift Allowance (minimum £90).

Applicants should possess good technical qualifications and have had training and experience in the control and operation of modern steam generating plant and main switchgear.

Applications on Form A.E.6/ACT, obtainable from the Personnel Department, 26 Oakfield Rd, Bristol 8, should be completed and returned by 13 Nov., 1961. (C 474)

LONDON ELECTRICITY BOARD

VACANCIES:

ENGINEERING DRAUGHTSMEN

APPLICATIONS are invited for vacancies in the Chief Engineer's Design and Planning Branch Drawing Office at Lesco Hse, Stamford St, S.E.1.

Duties will include the design and layout of main substations, alternatively surveying on site and constructional details in connection with the laying of E.H.V. tansmission cables.

Candidates should have received a good general and technical education and possess the O.N.C. in electrical engineering. They should preferably be not less than 22 years of age.

The posts are graded under Schedule A of the National Joint Board Agreement, Class BX (Area), as Grade 12, salary range £875/£1,140 per annum inclusive of London Allowance, alternatively as Grade 13, salary range £820/£1,065 per annum inclusive, respectively.

Application form obtainable from the Personnel Officer at 46 New Broad St, E.C.2, to be returned completed within 14 days of the publication date of this notice. Please quote ref.: PER/V/3448/T. (C 451)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

North Caledonia Area

APPLICATIONS are invited for the following superannuated posts:

FOURTH ASSISTANT ENGINEER
(OPERATION AND MAINTENANCE)

Vacancy No. 61/21.

For duty with a maintenance squad at Elgin, Morayshire. Experience in the construction and maintenance of overhead lines and/or Substations is desirable. Technical qualifications Ordinary National Certificate or equivalent.

Salary: Class H, Grade 13 (Scale 4), £765/£870.

GENERAL ASSISTANT DISTRICT ENGINEER
(EAST DISTRICT)

Vacancy No. 61/22.

To assist the Section Engineer at Fraserburgh, Aberdeenshire. Practical experience required and some knowledge of the Electricity Supply Industry would be an advantage. Technical qualifications Ordinary National Certificate or equivalent.

Salary: Class F, Grade 11 (Scale 4), £765/£870. Salary and conditions in accordance with the N.J.B. Schedule.

Application forms obtainable from the Area Manager, West Villa, South St, Elgin, should be returned by 20 Nov., 1961, quoting the appropriate Vacancy Number. (C 477)

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the superannuable position of

OPERATION SUPERINTENDENT

AT KINCARDINE GENERATING STATION

The Station consists at present of three 120 MW units, with two 200 MW units in course of construction. The units are coal fired with re-heat, having steam conditions of 1,500 p.s.i., 1,000°F for the 120 MW units, and 2,350 p.s.i., 1,050°F for the 200 MW units.

Candidates should possess technical qualifications of not less than Higher National Certificate standard and, preferably, be members of the Institution of Electrical or the Institution of Mechanical Engineers. They should have had considerable operation experience in modern generating stations. The successful applicant will be responsible to the Deputy Superintendent for the efficient operation of all station plant and for the control of the operation staff.

Salary: N.J.B., Class K, Grade 4, £1,650/£1,830, rising ultimately to Class M, Grade 4, £1,920/£2,085.

Applications, quoting reference G33/61, should be submitted on the standard form to the Secretary, South of Scotland Electricity Board, Inverlair Ave, Glasgow S.4, not later than 17 Nov., 1961. (C 447)

CENTRAL ELECTRICITY GENERATING BOARD

Southern Division

South Western Region

ASSISTANT ENGINEER (INSTRUMENTS)

PORTSMOUTH GENERATING STATION

CANDIDATES should have previous experience of modern generating station plant and a sound knowledge of instruments and other measuring apparatus used in generating stations.

Applicants should have had a sound technical training and should possess qualifications leading to corporate membership of an appropriate professional institution, or hold equivalent qualifications.

Salary: N.J.B. Scale 7, Grade H.10, £965/£1,090.

Special application forms obtainable from Divisional Secretary, 111 High St, Portsmouth, should be returned by 14 Nov., 1961. (C 459)

Eastern Electricity

Essex Sub-Area

THIRD ASSISTANT ENGINEER

CONTROL (SHIFT DUTIES)

SUB-AREA HEADQUARTERS

222/61.R.

CANDIDATES should be experienced in the operation of a large high voltage distribution system; be fully conversant with the Central Electricity Safety Rules (Distribution); and be capable of taking charge of all system operation during their shift.

Salary: N.J.B. Class M, Grade 10 (£1,325/£1,460), inclusive of London Allowance, plus 10% Shift Allowance.

Apply by letter to C. C. Brazier, A.M.I.E.E., Engineer, Essex Sub-Area, Eastern Electricity Board, "Millfield," Bentley, nr. Brentwood, Essex, by 17 Nov., 1961. (C 461)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT SECTION ENGINEER

REQUIRED in the Liverpool North District of the Board's No. 1 Sub-Area. Salary within range £1,115/£1,245 per annum (N.J.B. J/9).

Applicants should have had technical training, and had operational experience of h.v. and l.v. networks including substations. Technical qualifications desirable.

Appointment subject to medical examination. Pension Scheme.

Application forms may be obtained from the Manager, No. 1 Sub-Area, 24 Hatton Garden, Liverpool 3, and should be returned not later than 17 Nov., 1961. (C 443)

THE SOUTH WALES ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEER

(SURVEYOR DRAUGHTSMAN)

APPLICATIONS are invited for the position of General Assistant Engineer (Surveyor/Draughtsman) in the Port Talbot District of the Swansea and West Central Area.

Salary: N.J.B. Class H, Grade 13, Scale 4, £765/£870 per annum.

Applications stating age, present position, salary, qualifications and experience, should be addressed to G. R. T. Edwards, B.SC., M.I.E.E., M.AM.I.E.E., Manager, Swansea and West Central Area, 29 Ystrad Rd, Swansea, to arrive not later than 18 Nov., 1961.

Please quote reference 134/61/ET, endorsing envelope "Surveyor Draughtsman."

R. G. WILLIAMS,
Secretary.
(C 460)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

Classified advertisements continued on page 48

61 UNIVERSITY SCHOLARSHIPS offered by Electricity Supply

61 university scholarships are offered this year by the Electricity Supply Industry of England and Wales to sixth-formers wishing to read for degrees in science and engineering.

Each scholarship is worth up to £375 a year, plus full fees.

36 scholarships, all in electrical engineering, are offered by the 12 Area Electricity Boards. 25 scholarships, in a wide range of science and engineering subjects, are offered by the Central Electricity Generating Board.

All scholars will be offered, after graduation, practical training or staff posts in this essential, rapidly expanding industry.

Full details and application forms have been sent to the Head Teachers of Grammar and Public Schools throughout Great Britain. Additional copies, and further information, may be obtained from:

The Education and Training Officer,
The Electricity Council, 13 Winsley Street,
London, W.1.

17719/3

Electrical Fault Diagnosis

By S. SPENCE, B.Sc.

A quick guide to trouble finding in all classes of industrial electrical equipment. By the use of tables specially classified according to defects in plant, a direct lead is given to the causes of trouble and the appropriate action required. The tables also act as a check list to ensure that no possible cause is overlooked.

Designed for the works maintenance engineer, the tables are sectionalised to cover a.c. motors, d.c. machines, a.c. generators, rotary converters, bearings, transformers, mercury arc rectifiers, starters and switchgear and fluorescent lighting.

This book will prove invaluable to all concerned with the care of electrical equipment.

Attractively bound in stiff cover, consisting of 140 pages complete with diagrams and tables, overall size 8¾" x 5¾". An indispensable book to maintenance engineers.

Price 15/- Post Free

FROM PUBLISHING DEPARTMENT

The ELECTRICAL TIMES Ltd

Publishing Department · Sardinia House · Sardinia Street · London, W.C.2

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A REPRESENTATIVE is required by a Company manufacturing small electro-mechanisms, to cover London and the South Eastern Area. Applications are invited from experienced men, with an electrical engineering background, within the age group 25/35 years. Write Box 9598, Frost-Smith Advg, 64 Finsbury Pavement, London E.C.2. (C 409)

BRITISH ENGINE BOILER AND ELECTRICAL INSURANCE CO. LTD., Longridge Hse, Manchester 4. ELECTRICAL SURVEYORS required in England and Scotland. Permanent positions carrying progressive salary scale £825/£1,225, with non-contributory pension. Candidates aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E. and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience. (C 455)

COMMERCIAL SALES ENGINEER required by Merchant Company operating in the Far East, for service in the Federation of Malaya. Minimum qualification O.N.C. (either Elec. or Mech.); age about 25. Good salary, scale according to qualifications and experience; excellent prospects. Annual increments; Provident Fund; Non-contributory Pension Scheme; free furnished accommodation; passage provided. Apply, by letter, Box No. 2067, c/o Abbotts, Eastcheap, London E.C.3. (C 433)

ELECTRICAL CONTRACTORS of repute in Leeds require experienced ESTIMATOR, knowledgeable of large industrial and commercial installations, etc. Excellent prospects of promotion to energetic and capable person. Replies to Box 8461, Electrical Times. (C 480)

SALES REPRESENTATIVE required for Electric Cables in the London and Home Counties area. Previous experience necessary. Apply: Sales Manager, Hackbridge Cable Co. Ltd., Kelvin Wks, Hackbridge, Surrey. (C 472)

WELL-EDUCATED Young Man, aged between 25-35, with sound electrical training, required as TECHNICAL REPRESENTATIVE for the sales of resistance alloys in the midlands and south. Excellent prospects for the right man. Apply by letter to General Sales Director, Hall and Pickles Ltd., Port St, Manchester 1. (C 408)

LARGE PUBLISHING COMPANY requires REPRESENTATIVES for their new technical division calling on the electrical trades industry. Candidates for this position must be presentable, ambitious, and over 25. Preference will be given to applicants with an electrical engineering background, but full training offered to candidates with no previous experience. For appointment, telephone Mr Abbott at FLE 1296, or write Box 8463, Electrical Times. (C 481)

WANTED

WANTED for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of second-hand machinery and plant for re-use.—W. and H. Cooper Ltd., 17 Brady St, Bethnal Green, E.1. (C1)

FOR SALE

A.A. ELECTRICAL CO. for A.C.-D.C. MOTORS, Switchgear, Exhaust Fans, Hoists, Reduction Gears, new or reconditioned units.—CHI 5105, 67 Rothschild Rd, W.4. (C 2)

A.C. AND D.C. MOTORS, Generators, new and reconditioned. REWINDS and repairs promptly executed.—Service Electric Co. Ltd., Honeypot La, Stanmore, Middx. Edgware 5566. (C 8)

INFRA RED
HEATING AND DRYING
For Industrial Processes
GEORGE VOKES (INFRA RED) LTD.
98 WARDOUR STREET, LONDON, W.1.
and
INFRA RED WORKS, HIGH ROAD, N.11.
GERrard 2722 **ENTerprise 4584**
(C 11)

ELECTRIC MOTORS, D.C. and A.C. Motor Generator Sets, Alternators and Dynamos, Diesel Sets, Circuit-breakers, Switchboards, reconditioned and guaranteed. Very large stocks held.—Britannia Manufacturing Co. Ltd., Britannia Walk, N.1. CLErkenwell 5512/3/3. Stores at Chobham, Surrey. (C 5)

HOUSE-SERVICE METERS, all types can be obtained by return from Selectrics. Dept. E.T., Meter Hse, Factory Row, Castle Circus, Torquay. Phone 7218. (C 6)

HOUSE-SERVICE METERS, A.C. or D.C., quarterly or prepayment. — Universal Electrical, 221 City Rd, London, E.C.1. (C 3)

Have a word with your Electrical Staff about—
PORTAWAY
(REGD.)
FOR ELECTRICAL SAFETY
2 NORTH PARK ROAD
HARROGATE
YORKS
EARTHING EQUIPMENT LIMITED
T.A. PORTAWAY · T.N. 3853
Illustrated price list on request. (C 386)

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PATENTS

THE proprietor of British Patent No. 758,138, entitled "Electric Discharge Rectifier System," offers same for licence or otherwise to ensure practical working in Great Britain. Inquiries to Singer, Stern and Carlberg, 140 So. Dearborn St, Chicago 3, Illinois, U.S.A. (C 444)

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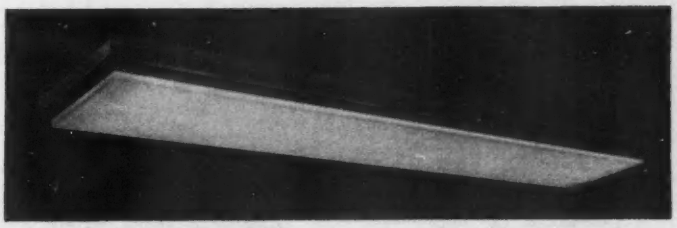

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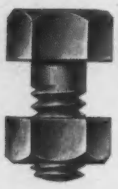

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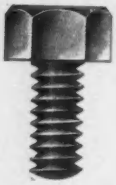

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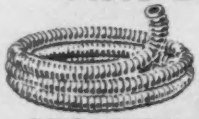

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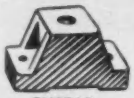

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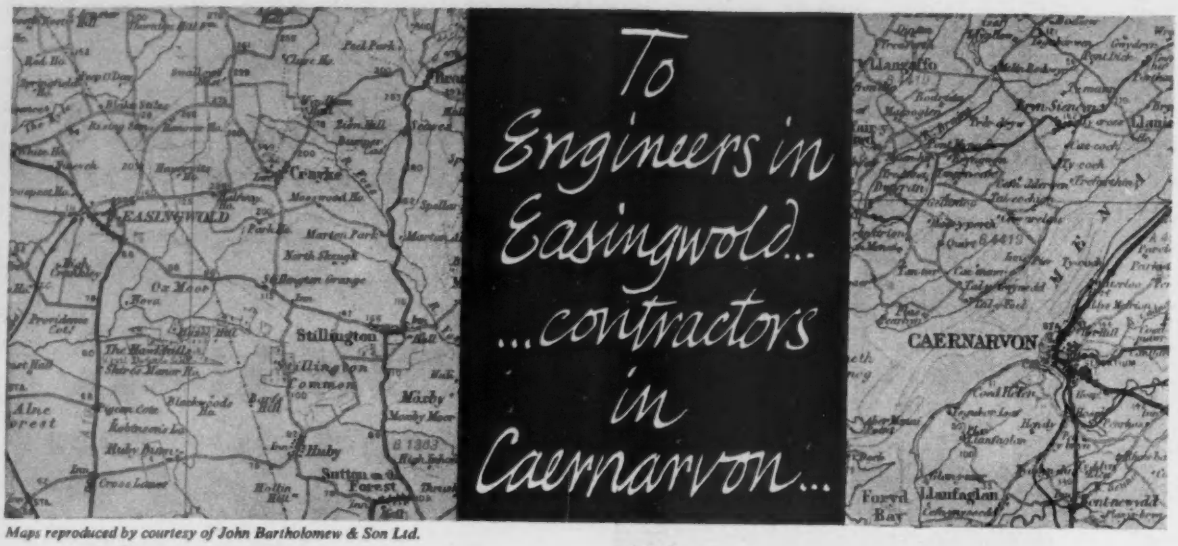

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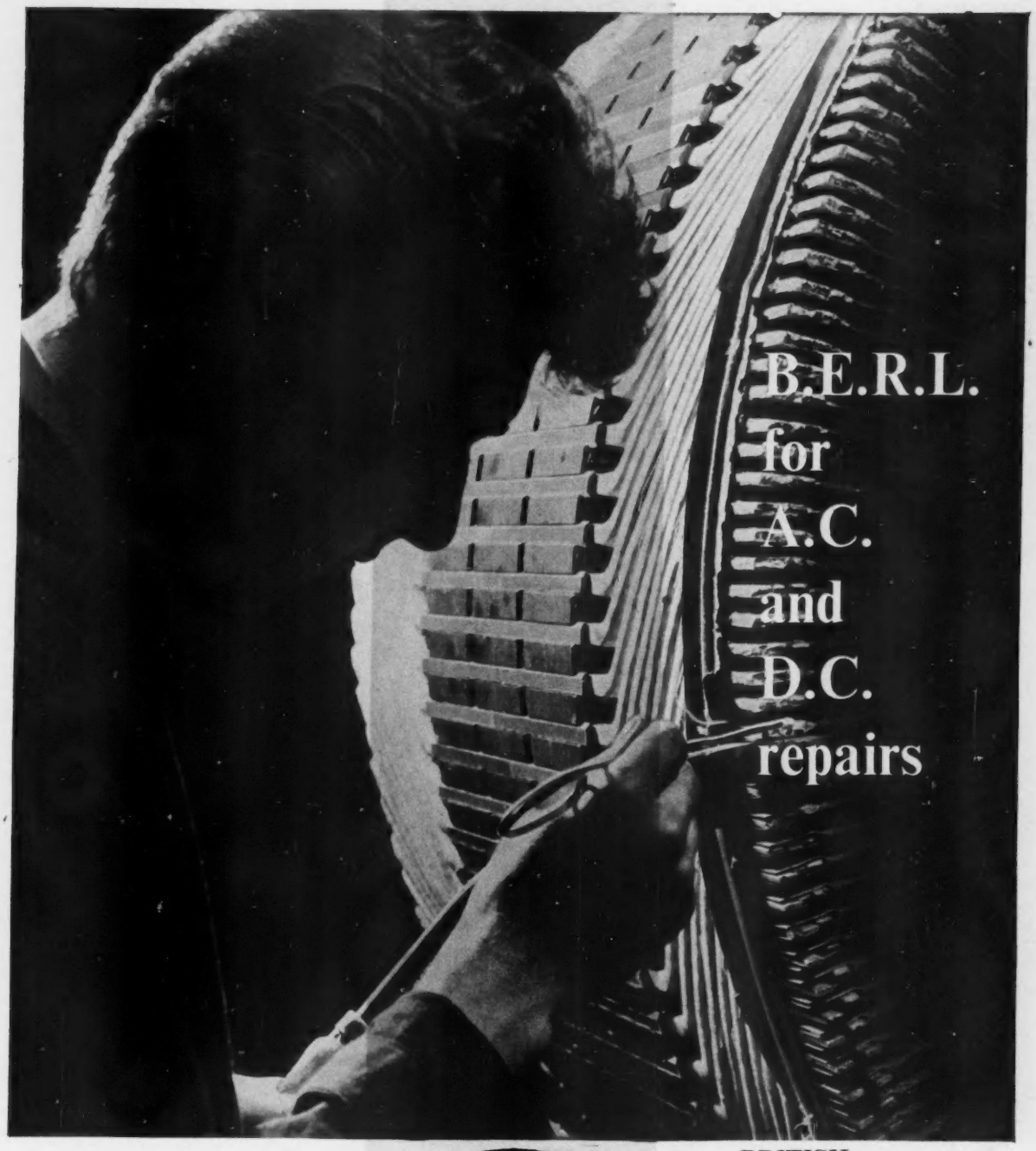

The illustration shows the soldering of the winding to commutator risers of a 1250 kW., D.C. generator armature.

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